VII

ARTIFACT ANALYSIS

A. INTRODUCTION

Archaeological investigations at Site 7S-F-68 resulted in the recovery of 6,518 prehistoric artifacts, of which 6,409 are stone tools and debris and 109 are pottery sherds and fragments of burned clay. Chipped-stone tools and debitage are the most common lithic artifacts, and they are primarily manufactured from jasper and chert (Table 8 and 9).

Temporally diagnostic artifacts, primarily bifaces (Tables 10-12), indicate that the site was repeatedly occupied from the Paleoindian through the Late Woodland period, but none of these occupations were long-term settlements. In the preceding chapter it was demonstrated that, while discrete occupational episodes are difficult to delineate, occupations can be grouped into three broad temporal units: Early (Paleoindian and Early Archaic), Middle (Late Archaic and Early Woodland), and Late (Late Woodland).

In this chapter, lithic and ceramic data are used to investigate site chronology, site function, site patterning, settlement patterns, and subsistence practices. To facilitate the investigation of these issues, artifacts from all phases of work were combined into one database. The Phase I and II artifacts were reexamined to ensure that all of the information in the database was recorded in the same fashion and at the same level of detail. This step was easily completed and permitted the largest possible database to be assembled.

B. THEORETICAL ORIENTATION AND RESEARCH ISSUES

Lithic artifacts account for more than 90 percent of the prehistoric artifacts recovered from the site and thus constitute the primary data set. Their abundance is partly attributable to their durability and chemical stability, unlike artifacts fashioned from organic materials or even artifacts manufactured from fired clay. This differential preservation of the total artifact assemblage skews interpretations by placing greater emphasis on those activities that required stone tools and generated lithic debris. It also forces researchers to glean as much information as possible from lithic assemblages.

An exception to the rule of lithic artifact stability is the rapid weathering of artifacts manufactured from argillite. Their instability must be kept in mind when comparing the quantities of different lithic materials in an assemblage. Small, thin argillite artifacts, like debitage, can often be completely erased (eroded) from archaeological deposits.

In this study, stone tools are considered byproducts of human behavior, particularly economic behavior. The economy of a society is the process by which that society provisions itself, and technology is the means by which provisioning is achieved and maintained. Technology is a key element in human adaptive strategies (White 1959).

Lithic technology--the manufacture and use of stone tools--is the primary focus of this chapter and is examined through an organizational approach, referred to as "the organization of technology" or "technological organization" (see Nelson 1991). Central to the approach is the investigation of assemblage variability, with the realization that variability is shaped by a number of interrelated factors or constraints, for example, settlement mobility, subsistence strategies, raw material availability, and site formation processes.

The organization of lithic technology is investigated by sorting lithic assemblages into a series of chipped-stone and groundstone industries (e.g., Clark 1988; Koldehoff 1987; Parry 1987). Specific industries are defined on the basis of production procedures, raw material requirements, and tool-design strategies. Industries are characterized as following an expedient or curated tool-design strategy. Expedient tools are usually informal tools that are made, used, and discarded at the same location, while curated tools are usually formalized tools that are made to be reused over an extended period, often at varying locations across the landscape (Binford 1979; Nelson 1991). Examples of curated tools are projectile points and other types of hafted bifaces; examples of expedient tools are unretouched or minimally retouched flake knives and scrapers. By design, curated tools have longer use lives than do expedient tools, and curated tools tend to have longer and more complicated life cycles because they are routinely subjected to maintenance and are often recycled (Schiffer 1972) (Figure 14).

The concepts of tool-design strategies, tool use lives, and tool life cycles are important to the investigation

TABLE 8: COUNT, WEIGHT, AND MEAN WEIGHT OF RAW MATERIAL TYPES FOR ALL CHIPPED-STONE ARTIFACT CLASSES

RAW MATERIAL TYPE	Count	Weight	Mean Weight
Jasper	3,413	1,964.9	0.6
Chert	1,187	765.7	0.6
Vein Quartz	820	1371.8	1.7
Quartzite	360	2,097.1	5.8
Argillite	88	1,791.1	20.4
Chalcedony	52	114.3	2.2
Crystal Quartz	35	18.4	0.5
Rhyolite	18	15.7	0.9
Igneous/Metamorphic	14	163.8	11.7
Ironstone	13	59.0	4.5
Indeterminate	85	42.3	0.5
TOTAL	6,085	8,404.1	1.4

Note: all weights expressed in grams.

of the research issues that were selected in accordance with the project's research design and are outlined below.

1. *Site Chronology*

Basic to any archaeological investigation is the identification of temporal/cultural components. Critical to this task is the identification of temporally diagnostic artifacts and the "mapping out" of their horizontal and vertical distribution across the site. In this chapter, and in the preceding chapter, temporally diagnostic artifacts are identified, and their site contexts examined. The methods of artifact identification are discussed below.

2. *Site Function*

Site function refers to the nature of the site: How was this particular spot on the landscape used? The key to answering this question lies in the types of activities that were conducted at the site. As mentioned earlier, not all activities required stone tools or generated lithic debris. Furthermore, not every stone tool that was used at a site was discarded at that site. Curated tools, for example, would have been used at several different sites but would have been discarded at only one (Binford 1979; Schiffer 1972, 1976). Despite these limitations, lithic assemblages furnish many insights into the activities that were conducted at a site, and also provide some measure of the intensity or duration of an individual occupation. The technological and functional analysis of lithic tools and debris supplies the main body of data needed to address this issue. These methods of analysis are discussed in the next section.

TABLE 9: FREQUENCY OF PREHISTORIC ARTIFACT CLASSES BY COUNT AND WEIGHT

ARTIFACT CLASS	Count	Weight
Bifaces	125	3,164.8
Cores	54	754.6
Cobble Tools	17	9,031.3
Debitage	5,840	4,145.0
Cracked Rock	273	6,222.6
Groundstone Tools	1	0.7
Minerals	33	64.2
Prehistoric Pottery	109	172.2
Unifaces	66	339.7
TOTAL	6,518	23,895.1

Note: all weights expressed in grams.

3. *Site Patterning*

Combining information about site formation processes, cultural components, and site activities, site patterning examines spatial relationships between temporally diagnostic artifacts and other classes of tools and debris with the aim of delineating temporally discrete activity areas or refuse disposal patterns. To aid this investigation and the investigation of site formation, several artifact classes were subjected to refitting exercises. The procedures followed during these refitting exercises have been briefly discussed in the previous chapter.

4. *Settlement Patterns*

To study settlement patterns and settlement systems (Winters 1969), contemporaneous sites or components are characterized as to their function (site type), and their distribution on the landscape is examined for patterns. Inferences that are derived from these pat

Table 10: Summary of Bifacial Tools

	BIFACE TYPE							
RAW MATERIAL	PROJECTILE POINT	EARLY STAGE	MIDDLE STAGE	LATE STAGE	OTHER	INDET.	TOTAL	% OF TOTAL
JASPER	41	1	2	2	.	14	60	48
CHERT	13	3	2			7	25	20
ARGILLITE	9	1	1	.	.	3	14	11
QUARTZ	5	3	1	1	.	3	13	10
QUARTZITE	3	.	.	1	2	.	6	5
CHALCEDONY	2	.	.	.	.	.	2	2
RHYOLITE	2	.	.	.	.	.	2	2
IGNEOUS/ METAMORPHIC	1	.	.	.	.	1	2	2
IRONSTONE	.	.	.	.	1	.	1	1
TOTAL	76	8	6	4	3	28	125	100%

terns most frequently pertain to strategies of resource acquisition; foremost is the acquisition of food. Lithic artifacts, as outlined above, furnish insights into site function. More importantly, if researchers identify the raw materials that were used in tool manufacture and determine the availability of these raw materials across the landscape, lithic assemblages can furnish insights into patterns of settlement mobility and land use (e.g., Ellis and Lothrop 1989). How the site may have fit into a regional settlement system is explored through the investigation of lithic procurement strategies. The methods used to identify raw materials and establish their availability are discussed later in this chapter.

5. *Subsistence Practices*

Intertwined with the issues of site function and settlement patterns is the issue of subsistence. In general terms, the diversity and intensity of certain subsistence activities can be documented by using data derived from the technological and functional analysis of the lithic assemblage. More specific information is derived from the analysis of residues found adhering to the surfaces of stone tools. Together, these lines of evidence furnish a rudimentary picture of subsistence practices, which is enhanced by the recovery of floral and faunal remains.

C. ANALYTICAL METHODS

The methods and procedures used to generate data are described in the following sections. In all cases, as artifacts were analyzed, information was recorded on analysis sheets as a series of codes, and the codes were then entered into a computer database program (R:BASE). A more complete discussion of the coding system can be found in Taylor and Koldehoff (1991).

1. *Ceramic Artifacts*

Two types of ceramic artifacts were recovered: fragments of burned clay, and pottery sherds. The fragments of burned clay were counted and weighed to the nearest tenth of a gram. The following attributes were recorded for sherds: vessel portion, temper, surface treatment, maximum thickness, count, and weight to the nearest tenth of a gram. Thickness was measured with vernier calipers but only for sherds with intact (i.e., uneroded) surfaces. Sherds were assigned to established ware types with the assistance of Dr. Robert Wall.

2. *Lithic Artifacts*

Five categories of information were derived from lithic artifacts: depositional, temporal/stylistic, functional, technological, and raw material. The methods used in the raw material and depositional (refitting) analyses are discussed with their results in other sections of this report. Residue analysis was also conducted, and the methods used are discussed with its results later in this chapter.

a) *Technological and Functional Analysis*

The analytical approach to stone-tool production and use taken in this study can be described as technomorphological; that is, artifacts were grouped into general *Classes* and then further divided into specific *Types* based upon key morphological attributes, which are linked to or indicative of particular stone-tool production (reduction) strategies. Function was inferred from morphology, as well as from use-wear. Surfaces and edges were examined for traces of use polish and damage with the unaided eye and with a 10X hand lens. Data derived from ethnoarchaeological and experimental research were relied upon in the identification and interpretation of artifact types. The

Table 11: Summary of Projectile Points

POINT TYPE	RAW MATERIAL JASPER	CHERT	ARGIL-LITE	QUARTZ	QUART-ZITE	CHAL-CEDONY	RHYO-LITE	TOTALS
Paleoindian	1	.	.	.	.	.	.	1
Generalized Early Archaic	2	1	.	1	.	.	.	4
Palmer	1	.	.	.	.	.	.	1
Kirk Corner Notched	1	.	.	.	.	.	.	1
Kirk Stemmed	2	2	.	.	2	1	.	7
Bifurcate Base	2	3	.	1	.	.	.	6
Otter Creek	.	.	.	.	.	.	1	1
Late Archaic/E. Woodland	4	1	7	.	.	.	.	12
Late Woodland	1	.	.	.	.	.	.	1
TOTALS	14	7	7	2	2	1	1	34

works of Callahan (1979), Clark (1986, 1988), Crabtree (1972), Flenniken (1981), Gould (1980), and Parry (1987) were drawn upon most heavily.

A conservative approach to the identification of edge utilization and retouch was taken because a number of other factors--for example, trampling of materials on living surfaces, spontaneous retouch during flake detachment, and trowel contact, can produce similar types of damage. More precise and accurate information about tool use can be obtained if higher levels of magnification are employed (e.g., Keely 1980; Yerkes 1987), but these methods are time consuming and expensive if large numbers of artifacts are examined. However, an aggressive residue analysis program was undertaken: nearly 200 lithic artifacts were analyzed, and the results provide data not only about tool use but also about subsistence practices.

It must be noted that, for ease of analysis, only the primary or main function of artifacts with evidence of multiple functions is presented in tabular form; in the artifact inventory secondary or additional functions are listed as notes in the database. These additional functions are mentioned in the text when significant.

Organized by artifact classes, artifact types are listed below, followed by a brief definition. All types were quantified by count and by weight to the nearest tenth of a gram.

1) Debitage

Debitage includes all types of chipped-stone refuse that bear no obvious traces of having been utilized or intentionally modified. The two basic forms of debitage are flakes and shatter. Debitage was sorted into eight types, and observations on raw material and cortex were recorded. How these latter two variables were classified is discussed later.

Decortication Flakes are intact or nearly intact flakes with 50 percent or more cortex covering their dorsal surface. These are the first series of flakes detached during lithic reduction.

Early Reduction Flakes are intact or nearly intact flakes with less than 50 percent dorsal cortex, fewer than four dorsal flake scars, on the average, and irregularly shaped platforms with minimal faceting and lipping. Platform grinding is not always present. These flakes could have been detached from early- to middle-stage bifaces or from freehand or bipolar cores.

Biface Reduction Flakes are intact or nearly intact flakes with multiple overlapping dorsal flake scars and small elliptically shaped platforms with multiple facets. Platform grinding is usually present. Platforms are distinctive because they represent tiny slivers of what once was the edge of a biface. Biface reduction flakes are generated during the later stages of biface reduction and also during biface maintenance (resharpening).

Bipolar Reduction Flakes are intact or nearly intact flakes that have been struck from a bipolar core. They typically exhibit sheared cones or bulbs, closely spaced ripples, and crushed and splintered platforms. Crushing can also occur on the termination of flakes (distal end), but it is a common misconception that platforms and bulbs are present on both ends of each flake. Not all flakes that are generated during bipolar reduction are distinguishable as bipolar flakes, and large amounts of shatter are usually created.

Block Shatter are angular or blocky fragments that do not possess platforms or bulbs. Generally the result of uncontrolled fracturing along inclusions or internal fracture planes, block shatter is most frequently produced during the early reduction of cores and bifaces. Block shatter is common in bipolar reduction, and it

TABLE 12: SUMMARY OF PROJECTILE POINT MEASUREMENTS

POINT TYPE		LENGTH	WIDTH	THICKNESS
Palmer (N=1)				
	Mean	22.5	20.7	5.7
Kirk Corner Notched (N=1)				
	Mean	24.5	19.0	4.5
Kirk Stemmed (N=7)				
	Mean	36.5	18.6	7.0
	Range	19.0 - 44.1	11.0 - 21.2	4.9 - 8.8
Bifurcate Base (N=1)				
	Mean	25.5	16.2	8.5
Otter Creek (N=1)				
	Mean	40.0	25.5	6.0
Late Archaic/Early Woodland (N=8)				
	Mean	41.9	22.1	8.1
	Range	30.3 - 58.5	16.8 - 28.5	6.9 - 11.7
Late Woodland (N=1)				
	Mean	28.9	22.1	3.7

Note: measurements expressed in millimeters.

is equivalent to "primary shatter" (Binford and Quimby 1963).

Flake Shatter are small, flat fragments or splinters that lack platforms, bulbs, and other obvious flake attributes. Flake shatter is generated throughout a reduction sequence but is most common in later stages. It is a common byproduct of bipolar reduction, and it is equivalent to "secondary shatter" (Binford and Quimby 1963). Trampling of debitage on living surfaces also generates flake shatter, while thermal fracturing produces both flake and block shatter.

Flake Fragments are sections of flakes that are too fragmentary to be assigned to a particular flake type. Typical specimens are medial and distal fragments of flakes.

Indeterminate Flakes are flakes that cannot be assigned to a specific type because their surfaces have been severely damaged (e.g., pot lidding) or eroded (e.g., argillite debitage).

2) Cores

Cores are cobbles or blocks of raw material that have had one or more flakes detached, but they have not been shaped into tools or used extensively for tasks other than being nuclei from which flakes have been struck. Cores come in various shapes and sizes, depending upon their degree of reduction and the methods of reduction that were applied. Three core types were identified, and variables recorded include raw material and cortex. If evidence of use-wear was detected, this information was entered into the database as free-form text.

Freehand Cores are blocks or cobbles that have had flakes detached in multiple directions by holding the core in one hand and striking it with a hammerstone held in the other (Crabtree 1972). This procedure generates flakes that can be used as is for expedient tools or can be worked into formalized tools. Freehand percussion cores come in various shapes and sizes, depending upon the raw material form and the degree of reduction.

Bipolar Cores are cobbles or other pieces of raw material (e.g., broken tools and debitage) that have had flakes detached by direct hard-hammer percussion on an anvil: the core is placed on the anvil and struck vertically with a hammerstone (Crabtree 1972). Cores typically assume a tabular shape, exhibit heavy crushing and battering, and have flake scars that tend to run between areas of crushing and battering. Bipolar cores are normally smaller than freehand cores because bipolar reduction is a technique for maximizing available raw materials. Most flakes that are detached are only suitable for expedient flake tools. Bipolar reduction can also be used to recycle tools or sizable pieces of debitage into usable flakes. Bipolar cores could also have been used as wedges (see Flenniken 1981; Hayden 1980), but most of the specimens in the assemblage appear to be cores rather than wedges.

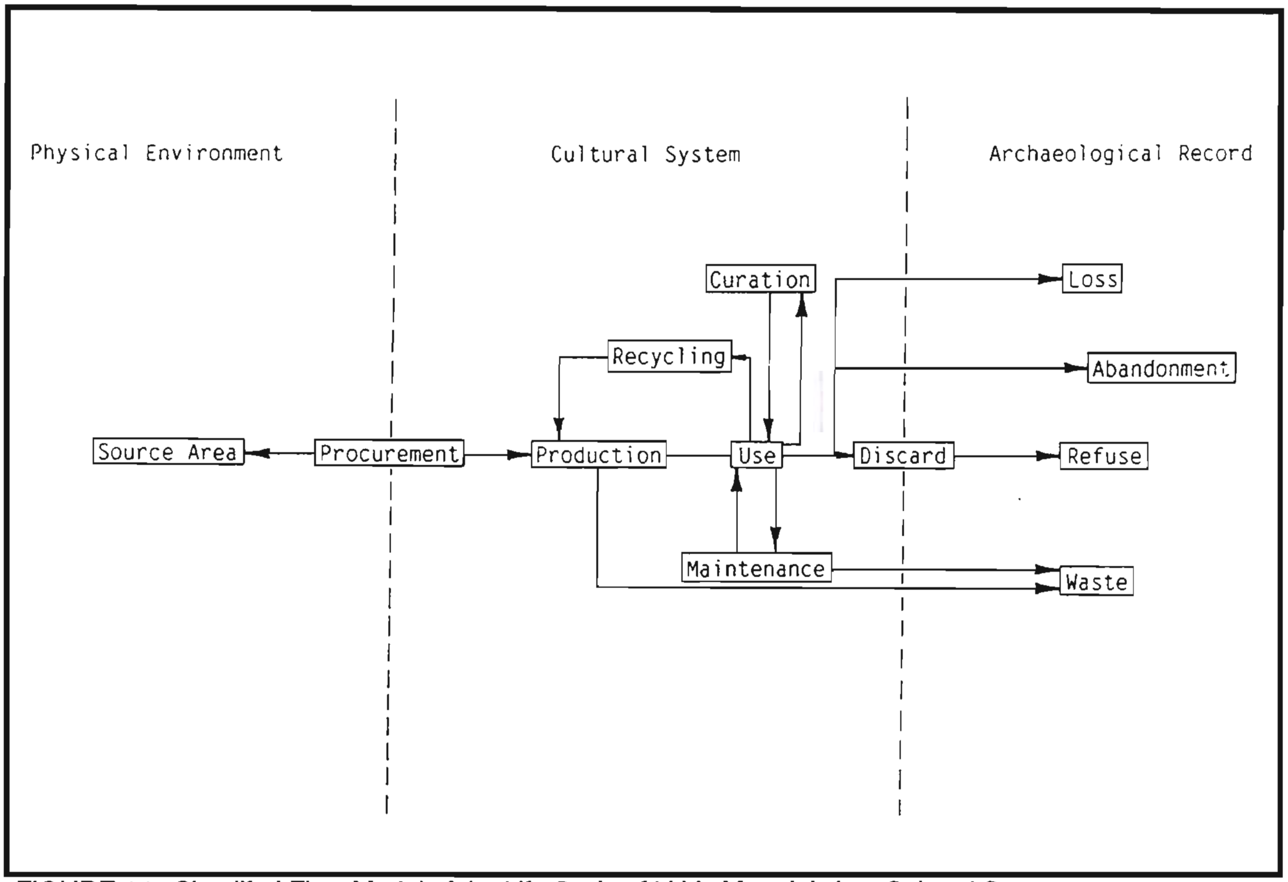


FIGURE 14: Simplifed Flow Model of the Life Cycle of Lithic Materials in a Cultural System.

Tested Cobbles are unmodified cobbles, blocks, or nodules that have had a few flakes detached to examine raw material quality. These cobbles were not worked into tools because they possessed raw material flaws or because they were set aside for future needs, which apparently never arose.

3) Unifaces

Unifaces include both formal tools (e.g., endscrapers) and informal tools (e.g., utilized and edge-retouched flakes). Flakes from cores and bifaces can be used as informal (expedient) tools or worked into formal tools. Five uniface types were recognized, and their raw material, cortex, and condition (whole or broken) were recorded. Whole specimens had their maximum length, width, and thickness recorded in millimeters. Additional functions were entered as notes in the database.

Endscrapers are formalized unifaces that have uniformly retouched edges, which creates a working edge and a standardized shape. The working edge is transverse to the long axis of the tool, and retouching often erases obvious indications that the tool is made on a flake. In some cases, endscrapers are bifacially worked, but they are still classified as unifaces.

Sidescrapers are formalized unifaces that have uniformly retouched edges, which creates a working edge(s) and a standardized shape. The working edge(s) parallels the long axis of the tool, and retouching often erases obvious indications that the tool is made from a flake.

Retouched Flakes are expedient tools that have had one or more edges retouched to resharpen the working edge, to create a dulled edge for grasping, or to form a specific edge angle or shape. The flake itself could have been detached from a core or a biface. It should be noted that severe edge damage can be difficult to discern from intentional retouching.

Utilized Flakes are expedient tools that exhibit traces of use damage and/or polish on one or more edges. These flakes could have been detached from cores or bifaces, and they were employed with no prior modification. Both retouched flakes and utilized flakes represent simple tools that were usually used in cutting and scraping tasks and afterwards discarded.

Denticulated Flakes are a special type of retouched flake. They are distinctive because appropriately spaced flakes have been detached from one or more edges to form a toothed or serrated edge. Various functions have been suggested for this tool type (or tool edge), such as shredding plant fibers or scaling fish, but support for these suggestions is lacking.

4) Bifaces

Bifaces are chipped-stone tools that have been shaped by the removal of flakes from both faces or sides of a cobble or large flake. In most cases, they are hafted and used as projectile points and/or knives. Technically, bifaces are also cores, for the flakes detached from them during production and maintenance can themselves be used as tools (see Kelly 1988). Bifaces were sorted into six types; attributes recorded include raw material, cortex, and condition. Intact bifaces were coded as whole and had their maximum length, width, and thickness recorded in millimeters. Broken bifaces had their condition coded as broken, except for broken projectile points, which were coded as tip, medial section, or base. All bifaces were subjected to a refitting exercise.

Early-Stage Bifaces are cobbles or large flakes that have had their edges bifacially trimmed and a few large reduction flakes detached. These bifacial blanks are equivalent to Callahan's Stage 2 bifaces (Callahan 1979). Because of their crude condition, they can be hard to distinguish from freehand cores and choppers. In fact, early-stage production failures could easily be recycled into these other tool types.

Middle-Stage Bifaces look more like bifaces; they have been initially thinned and shaped. A lenticular cross section is developing, but edges are sinuous, and patches of cortex may still remain on one or both faces. These bifaces are roughly equivalent to Callahan's Stage 3 bifaces (Callahan 1979). Biface reduction is a continuum; therefore, middle-stage bifaces are often difficult to distinguish from early- and late-stage bifaces, depending upon the point at which their reduction was halted. Moreover, rejected bifaces may have been used for other tasks (recycled).

Late-Stage Bifaces are basically finished bifaces; they are well thinned, symmetrical in outline and cross section, and edges are centered. Small areas of cortex may still exist on one or both faces. These bifacial preforms are roughly analogous to Callahan's Stage 4 bifaces (Callahan 1979).

Projectile Points are finished bifaces that were hafted and functioned as projectiles and/or knives. Intact projectile points and basal fragments were assigned to established point types.

Other Bifaces are bifaces that do not easily fit into the above types. Distinctive attributes or apparent functions were recorded as notes in the database.

Indeterminate Biface Fragments are sections of bifaces that are too badly damaged to be assigned to a specific type.

5) Cracked Rock

Cracked rock includes all fragments of lithic debris that cannot be attributed to stone-tool production. Most specimens represent fire-cracked rock (FCR): cobbles that were used in heating and cooking activities. All cracked rock was weighed , but no variables were recorded. All specimens were, however, subjected to a refitting exercise, the details of which are presented elsewhere.

6) Cobble Tools

Cobbles were used for various tasks with little or no prior modification. Battered, crushed, pitted, and/or abraded surfaces identify cobble tools. When multiple functions were evident, the cobble was assigned to the artifact type that best represented its "dominant" or "primary" function; additional functions were recorded as notes in the database. Eight types of cobble tools were identified. Raw material and condition were recorded; and when tools were whole, their maximum length, width, and thickness were recorded in millimeters.

Hammerstones are cobbles that show evidence of battering and crushing along their margins, indicating that they were intentionally used as percussors.

Manos or grinding stones are hand-sized cobbles with one or more flat surfaces that were used to crush and grind various materials, usually vegetable products, as is evidenced by smoothed and polished surfaces.

Anvilstones are cobbles that were used as a base on which to rest materials while they were struck with a hammer. Surfaces that are interpreted as anvils tend to possess shallow, coarse-textured depressions with amorphous outlines. A common activity that could have produced these depressions is bipolar reduction.

Pitted Cobbles or "nutting stones" are cobbles with at least one smooth depression no greater than about 4 cm in diameter. These depressions differ from anvil depressions in that they are smoother, often deeper, and tend to be circular or oval. These depressions are believed to be the result of processing nuts, as compared to anvil depressions.

Metates or grinding slabs are large cobbles with one or two flat or concave surfaces, which exhibit evidence of having been used as durable surfaces for grinding and crushing. These surfaces were used in combination with manos to process seeds and other plant foods.

Pestles are linear cobbles that exhibit crushing and smoothing on one or both ends or poles. Pestles can also be formalized tools that were shaped by pecking and grinding, but the specimens in the Site 7S-F-68 assemblage are merely linear cobbles.

Abraders are pieces of sandstone or related materials that were used to shape and sharpen tools made of various materials. Abraders are believed to have been used in the manufacture and maintenance of bone and wood tools and in the manufacture and maintenance of stone tools.

Other Cobble Tools are cobbles that do not fit into the above types. Key attributes and apparent functions are recorded as notes in the database.

7) Groundstone Tools

These highly formalized tools (and ornaments) were manufactured by pecking, grinding, and sometimes flaking. Typical artifact types are grooved axes, pipes, pendants, and bannerstones. Only one tiny fragment of a groundstone tool was recovered from the site.

8) Minerals

Unmodified or minimally modified crystals or chunks of naturally occurring chemical elements, for example limonite and hematite (iron ores), were classified as minerals. Three types of minerals were recognized: hematite, mica, and other. Under the last type, unmodified fragments of petrified wood were recorded.

b) *Stylistic Analysis*

Only projectile points (or hafted bifaces) were stylistically analyzed. They were segregated into groups on the basis of like morphology and technology. Technology refers to those aspects of production, maintenance, recycling, and hafting that are "recorded" or "preserved" on the surfaces of each specimen. Raw material was not considered a variable, except to the degree that different materials may have affected morphology because of their varying fracture mechanics (see Callahan 1979).

Bifaces were not directly assigned to point types. The hafted bifaces were first sorted into groups based upon shared attributes: overall size and shape, manufacturing and resharpening methods, haft morphology, presence or absence of haft grinding, blade morphology, and presence or absence of blade serration. These groups were then compared to established point types to find a "best fit." Some groups of bifaces fit established types better than others. The following reports were most heavily relied upon in matching these groups with established point types: Broyles (1971), Coe (1964), Ebright (1992), Evans (1984), Funk (1988), Gardner (1974), Gleach (1987), Kinsey (1972), Ritchie (1971), and Stephenson and Ferguson (1963).

Central to the analysis was the realization that hafted bifaces are dynamic entities. As curated tools, they were designed to be maintained, reused, and recycled (see Kelly 1988). Therefore, attempts by archaeologists to construct meaningful typologies must take this fact into account. At the same time, this fact does not negate the usefulness of hafted bifaces as "index fossils" of past cultures.

This issue has recently been debated by Great Basin archaeologists (Bettinger et al. 1991; Flenniken and Raymond 1986; Flenniken and Wilke 1989; Thomas 1986), and a review of the literature indicates that researchers in the Middle Atlantic often fail to consider the effects of resharpening and recycling on projectile point morphology. More often than not, hafted bifaces are sorted into point types as if they were static entities--their current morphology is taken at face value. Individual points, however, would not necessarily have experienced the same numbers and types of impact fractures or resharpening events. Full recognition of this fact may help to alleviate some of the confusion and difficulty currently experienced in establishing a more complete projectile point sequence for the Middle Atlantic region (Custer and Bachman 1986; Evans 1984; Evans and Custer 1990; Wesler 1983, 1985). The excavation of more sites with clearcut stratigraphic sequences and numerous points would be of great benefit in this regard. Site 7S-F-68 is not one of these sites, but it does have contributions to make.

D. LITHIC PROCUREMENT

Raw material analysis of the Site 7S-F-68 assemblage identified 13 different lithic types. Their availability is discussed in the next section, which is followed by a description of each type and a discussion of how they were identified and quantified. The last two sections examine and summarize procurement strategies for chipped-stone tool production. Groundstone tools are not considered because so few were recovered, and most were manufactured from cobbles, which were probably procured along with cobbles intended for chipped-stone use.

1. *The Lithic Landscape*

The term "lithic landscape" refers to the availability of lithic raw materials across a region or set area. Reconstructing the lithic landscape is an essential first step in investigating lithic procurement. It is reconstructed by reviewing geologic reports and maps and by conducting field surveys (see Blanton 1984; Gould and Saggers 1985).

Custer and Galasso (1980) provide a good overview of the lithic landscape of Delaware. In brief, bedrock or primary lithic source areas are restricted to the Fall Line area at the top or northern end of the Delmarva Peninsula. Two important resources in this area are Iron Hill jasper and Cecil County black flint or chert. This resource-rich area is referred to by Wilkins (1976) as the Delaware Chalcedony Complex (Figure 15). South of the Fall Line, gravels or secondary lithic deposits are scattered over the landscape. Some of these deposits are quite extensive and are comparable to primary lithic source areas, "in that they represent focal points on the landscape where large accumulations of lithic materials may be found" (Custer and Galasso 1980:9). In contrast, the rest of the Delmarva Peninsula is characterized as a "lithic-poor setting," where "small isolated pockets of cobble deposits are found" (Custer and Galasso 1980:9).

The area surrounding Site 7S-F-68, including virtually all of the Mid-Peninsular Drainage Divide physiographic zone, falls within this lithic-poor zone, evidenced by the rarity of cobbles and even pebbles in the site area. A limited effort was made to locate naturally occurring lithic cobbles in the headwaters of nearby streams, but none could be found.

Custer and Galasso aptly point out that, because secondary deposits on the Delmarva Peninsula contain cobbles and pebbles that have been transported down the Delaware and Susquehanna Rivers (and their ancestral streams), raw materials from large sections of the Middle Atlantic region could be found within these locally available gravels. However, two important raw materials available within the region--rhyolite and argillite--are less likely to be contained within these secondary deposits (Custer and Galasso 1980:7, 10). Of these two, argillite is more likely to be found within these deposits, but because it weathers so rapidly, cobbles of this material are often of little utility. Hence, these two materials are considered nonlocal resources. However, these secondary (cobble) sources can make it difficult to determine what percentage of the chert, jasper, quartz, and other raw materials in an assemblage were locally procured in cobble form or were procured at a distance from primary sources. Cortex provides the most direct measure of cobble versus bedrock procurement, and mean weight provides a basic index of distance to source (see below).

2. *Raw Material Analysis*

Raw materials were identified on the basis of macroscopic characteristics: color, texture, hardness, and inclusions. A 10X hand lens, and on occasion higher levels of magnification, were used to identify inclusions and to evaluate texture and structure. Archaeological and geological reference collections at the LBA laboratory in East Orange, New Jersey, were consulted during analysis.

Each of the 13 raw material types identified in the assemblage is listed below, with a brief description of its physical characteristics. As mentioned earlier, all lithic artifacts were quantified by count and by weight to the nearest tenth of a gram.

Cortex was recorded for all chipped-stone artifacts as followings: absent, block, cobble cortex, indeterminate cortex, and no observation. Block cortex denotes lithic procurement from primary or bedrock sources, while cobble cortex denotes use of secondary or cobble sources. Generally, block cortex is rugged and coarse textured, while cobble cortex is smooth and often polished. Cobbles can contain internal fracture planes however, and when exposed by knapping, can appear similar to block cortex; in addition, small patches of cortex can be difficult to evaluate. Consequently, cortex was coded as indeterminate when it was unclear whether it was cobble or block. No observation was coded when the presence or absence of cortex could not be determined; this procedure was limited to artifacts manufactured from argillite.

a) *Chert*

Chert is the second most common raw material in the assemblage. A variety of different formations and source areas appear to be represented. But, as discussed above, an array of nonlocal cherts could be locally available in secondary deposits. Although a range of textures and flaking qualities are represented, most chert artifacts are fine grained and are some shade of gray, particularly bluish gray. In part, this is a result of the manner in which chert artifacts were distinguished from jasper artifacts. To avoid confusion, cryptocrystalline materials that are yellow, tan, brown, or reddish brown were considered jasper. It is likely that much of the chert in the assemblage was ultimately derived from the Delaware Chalcedony

Complex, either by direct procurement or by procurement from secondary deposits.

b) *Jasper*

In the Site 7S-F-68 assemblage, jasper is the most common raw material. There are several known sources of jasper in the Middle Atlantic region (Hatch and Miller 1985; Stevenson et al. 1990), and as noted above, these jaspers could be locally available in cobble form. However, about half of the jasper in the assemblage is most similar to Iron Hill jasper, which typically exhibits a dark reddish brown color because of its high iron content.

c) *Rhyolite*

Rhyolite is a fine-grained extrusive igneous rock that can be conchoidally fractured. One of its most distinguishing features is quartz and feldspar phenocrysts, which are scattered throughout its matrix in varying quantities. The rhyolite in the 7S-F-68 assemblage is macroscopically indistinguishable from rhyolite deposits in the South Mountain area of northern Maryland and southern Pennsylvania, which are located about 200 km to the northwest (Figure 15). South Mountain rhyolite is in actuality a metarhyolite--that is, it has been subject to metamorphism. In general, this process increases flaking quality and imparts distinctive macroscopic characteristics, which help to separate it from rhyolites in adjacent regions. The exploitation of South Mountain rhyolite has been documented by R. Michael Stewart (1984a, 1984b, 1987, 1989b). Custer and Galasso (1980:10) state that the potential for rhyolite to be contained within cobble deposits is "virtually nonexistent."

d) *Argillite*

Argillite is partially metamorphosed mudstone, which, because of its hardness and fine texture, can be flaked. But it is a very brittle material that weathers rapidly once incorporated in most archaeological contexts. Large deposits of argillite are common in parts of the Middle Atlantic region, with the nearest deposits some 100 km up the Delaware River (Didier 1975). The argillite artifacts in the assemblage are primarily gray and greenish gray and highly weathered, with chalky exteriors. For this study, argillite is considered a nonlocal material because "its susceptibility to weathering means that cobbles would be likely to be small in size and not well suited for the manufacture of stone tools" (Custer and Galasso 1980:7).

e) *Quartz*

Two varieties of quartz were recovered from the site, vein quartz and rock quartz crystal. Rock quartz crystals are large individual crystals, which are transparent or nearly so, while vein quartz occurs as seams of interlocking crystals or massive crystalline structures. Vein quartz dominates the assemblage; rock quartz crystal is limited to a handful of artifacts. Specimens of vein quartz are, on occasion, partially transparent, but more often than not they could be described as opaque and white to light gray in color (i.e., milky quartz). A few specimens of vein quartz are pinkish and could be referred to as rose quartz. Both varieties of quartz are available in the uplands north of the Fall Line (Figure 15) and in secondary deposits south of the Fall Line.

f) *Quartzite*

Quartzite has traditionally been defined as metamorphosed sandstone. Heat and/or pressure transformed the sandstone into a more homogeneous matrix, which more readily transmits fractures through individual sand grains rather than around them. Research by geologists, however, has shown that many quartzites are not the product of metamorphism; rather, quartzites are of two basic types: sedimentary and metamorphic (see Ebright 1987). Sedimentary quartzites (or orthoquartzites) are more common than metamorphic quartzites (or metaquartzites), and they can be described as sandstones that have been cemented together by silica rather than transformed by heat and pressure. The flaking quality of orthoquartzites varies depending upon their degree of cementation: the more weakly cemented, the poorer the flaking quality. Even the best orthoquartzites and metaquartzites can be considered coarse grained and difficult to flake when compared to more homogeneous or isomorphic materials like chert and jasper (see Callahan 1979). A variety of quartzites are present in the assemblage. The level of effort required to distinguish different forms of quartzite exceeds the limits of this project (see Ebright 1987).

g) *Chalcedony*

Like chert and jasper, chalcedony is a cryptocrystalline material. For this study, the term chalcedony is applied to a distinctive fine-grained raw material, which differs from the chert and jasper in the assemblage because it is slightly coarser in texture, more translucent, and usually gray mottled with red and blue. That its texture and fracture mechanics are dissimilar to chert and jasper is apparent in the number of bifaces manufactured from this material that exhibit numerous flake scars with hinge terminations. The source may be the Delaware Chalcedony

Complex, and the material is probably contained within secondary deposits.

h) *Ironstone*

Ironstone is sand that has been welded together by the accretion of iron. Deposits of such materials are a common feature of the Coastal Plain, and because of its depositional history, it has been referred to as "bog iron" (see Vokes and Edwards 1974). Just south of the Fall Line (Figure 15), large deposits of fine-grained ironstone were exploited by prehistoric populations for the production of chipped-stone tools (Ward 1988). This raw material was little used by the groups that occupied Site 7S-F-68.

i) *Siltstone*

Siltstone is a fine-grained sedimentary rock. Only a few artifacts in the assemblage have been assigned to this material type, some of which have properties that are similar to low-grade chert.

j) *Sandstone*

Sandstone is a coarse-grained sedimentary rock, similar to ironstone, but its primary welding agent is not necessarily iron. Like siltstone, it is poorly represented in the assemblage.

k) *Steatite*

Steatite or soapstone is a fine-grained, compact, metamorphic rock, whose principal constituent is talc. This soft but durable material is ideal for manufacturing stone bowls and other groundstone implements. Steatite quarries have been reported from Washington, D.C., as well as from other areas of the Middle Atlantic (Holland et al. 1981; Holmes 1897). This material is represented in the assemblage by a tiny fragment of a groundstone tool.

l) *Igneous/Metamorphic*

Grouped under this type are a number of different igneous and metamorphic rock types, which are available north of the Fall Line in primary deposits and south of the Fall Line in secondary deposits. The most common materials in the assemblage are basalt (or diabase) and schist.

m) *Indeterminate*

Artifacts that could not be assigned to one of the above raw material types with a high degree of confidence were classified as indeterminate. Examples of such artifacts are tiny pieces of debitage and artifacts that have been severely burned.

3. *Procurement Strategies*

As previously mentioned, the lithic assemblage as a whole is dominated by chipped-stone tools and debitage. Jasper is, by count, the most common raw material used in chipped-stone tool production, but by weight, quartzite is the most common (Table 8). By count, the raw materials fall into the following order: jasper (56.0%), chert (19.5%), quartz (14.0%), quartzite (5.9%), (1.5%), chalcedony (0.9%), rhyolite (0.3%), igneous/metamorphic (0.2%), ironstone (0.2%), and indeterminate (1.4%). By weight, the order is different: quartzite (25.0%), jasper (23.4%), argillite (21.3%), quartz (16.5%), chert (9.1%), igneous/metamorphic (1.9%), chalcedony (1.4%), ironstone (0.7%), rhyolite (0.2%), and indeterminate (0.5%).

Jasper was clearly an important raw material, because it accounts for more than half of the chipped-stone assemblage by count and almost one-quarter of the assemblage by weight. That the raw materials do not follow the same order of popularity by count as by weight is expected: not all of the raw materials have the same availability across the landscape, nor do they have identical flaking properties. Those raw materials that flake the best should account for more of the assemblage by count than by weight because they would be reduced more intensively. For example, jasper, chert, and quartz (vein and crystal) account for 90 percent of the assemblage by count, but only 49 percent of the assemblage by weight. Differences in raw material availability and reduction strategies can be further documented by examining mean weight and cortex.

a) *Mean Weight*

Mean weight provides important insights into procurement and production, especially when coupled with a basic understanding of the local and regional lithic landscape. Given that large lumps of raw material require considerable effort to transport and that stone-tool production and maintenance is a subtractive process, it is generally accepted by researchers that the amount (or mean weight) of a particular raw material should decrease as one moves away from that raw material's source area (see Erickson and Purdy 1984; Renfrew 1977).

With this generalization in mind, note that chert and jasper have the same mean weight (0.6 g), which is undoubtedly a product of similar availability and similar procurement and reduction strategies. Indeterminate materials have the lowest mean weight (0.5 g), which is expected because the smallest artifacts are the most difficult to identify with certainty.

Rhyolite has the next lowest mean weight (0.9 g), and its low mean weight is expected because it is considered a nonlocal raw material. Likewise, then, argillite should have a low mean weight because it is also considered to be a nonlocal material. But this is not the case; argillite has the highest mean weight (20.4 g). If the very large, early-stage argillite biface (1491.0 g) from Feature 33 is deleted from the total count and weight for argillite (Table 8), the mean weight for argillite is reduced to 3.4 g, which more closely fits what is expected for a nonlocal raw material. Furthermore, it should be remembered that the mean weight of argillite is artificially inflated by the nonrecovery of small argillite debitage--resulting from its susceptibility to erosion. Vein and crystal quartz, combined, have a low mean weight (1.7 g), followed by chalcedony (2.2 g). After these raw materials, mean weight values greatly increase: ironstone (4.5 g), quartzite (5.8 g), and igneous/metamorphic (11.7 g). This is partly explicable by coarse texture and lower flaking quality of the latter materials.

The mean weight for each material's debitage assemblage is as follows: jasper, rhyolite, and indeterminate materials have the same value (0.4 g), followed by chert (0.5 g), ironstone (0.9 g), vein quartz and crystal quartz combined (1.2 g), chalcedony (2.0 g), argillite (2.4 g), quartzite (2.6 g), and igneous/metamorphic (4.9 g). The pattern is basically the same as above: jasper, chert, rhyolite, and indeterminate materials have the lowest mean weights, and quartzite and igneous/metamorphic materials have the highest. That argillite has a relatively high mean weight, even though it is considered nonlocal, is again attributed to its susceptibility to erosion.

However, another factor that may be contributing to the high mean weight of argillite is its method of procurement. Unlike those raw materials with low mean weights (rhyolite, jasper, and chert), it is possible that argillite was procured indirectly through exchange contacts in the Delaware Valley, while these other raw materials were procured directly from source areas as part of a group's seasonal movements. With the second scenario, "embedded" procurement (Binford 1979), tools and preforms made from a particular raw material are "consumed" (used, resharpened, and discarded) across the landscape; thus, mean weight should decrease as distance from source increases. In the first scenario, exchange, the rule of decreasing mean weight may not be expressed in the same way because large preforms or cores may have been transported from one region to another with little or no reduction. The large argillite biface from Feature 33 could exemplify the form in which argillite arrived at the site. That the only diagnostic bifaces manufactured from argillite are believed to be from the Late Archaic and Early Woodland periods lends credence to the above scenario because these periods are characterized as a time of increased exchange and reduced mobility (e.g., Custer 1988). Nevertheless, both scenarios are speculative and warrant further investigation. It is important to mention that the rhyolite sample is much smaller than the argillite sample and that the large argillite biface (Feature 33) was found stratigraphically below the argillite stemmed points.

Overall, analysis of mean weight supports the appraisal of rhyolite and argillite as nonlocal raw materials (i.e., unavailable on the Delmarva Peninsula), and their procurement was apparently achieved under different strategies: argillite procured via exchange and rhyolite procured by visits to its source area. The low mean weights for chert and jasper may in part be explained by long-distance procurement from bedrock sources (e.g., Delaware Chalcedony Complex), but these values are also a condition of the superior flaking quality of these materials and the absence of lithic raw materials in the site vicinity. If raw materials must be maximized, the higher quality materials will tend to be the focus of that maximization (e.g., Goodyear 1979, 1993). This interpretation may also apply to crystal quartz, for when it is separated from vein quartz, it has a low mean weight, 0.5 g. So, by mean weight alone, it cannot be determined whether jasper, chert, and quartz were primarily procured from local cobble sources or from more distant bedrock sources. Cortex provides another line of evidence.

b) *Cortex*

Lithic raw materials come in different kinds of "packages," and the exteriors of these packages furnish clues about where they can be found on the landscape. Cobbles are small lumps of raw material that have been transported by natural processes to secondary locations; their rinds or cortex bear the marks of this transportation. In contrast, raw materials collected from primary sources do not bear the marks of natural transportation. Therefore, as discussed above, cobble cortex implies secondary deposits, and block cortex implies primary deposits. Drawing upon the work of Custer and Galasso (1980), it can be stated with confidence that the only raw material sources on the Delmarva Peninsula below the Fall Line are secondary deposits, except for ironstone. However, this material is of little consequence in the assemblage. In simple terms, cobble cortex equals "local" procurement--that is, raw materials were obtained from somewhere on the Delmarva Peninsula; and block cortex equals "nonlocal" procurement--that is, raw materials were obtained from somewhere at or above the Fall Line.

Cortex types are summarized for each raw material in Table 13. Most of the raw materials have both types

Table 13: Summary of Cortex Types by Raw Material for the Chipped-Stone Assemblage

Raw Material		Cortex Type*					
		A	C	B	I	X	Total
Jasper							
	Count	2,560	794	40	19	.	3,413
	Weight	748.8	1156.2	35.9	24.0	.	1964.9
Chert							
	Count	947	212	16	11	1	1187
	Weight	322.0	348.0	67.8	26.7	1.2	765.7
Quartz							
	Count	638	206	5	6	.	855
	Weight	563.6	809.5	13.5	3.6	.	1390.2
Quartzite							
	Count	304	48	5	3	.	360
	Weight	666.5	1133.5	291.2	5.9	.	2097.1
Argillite							
	Count	.	.	.	.	88	88
	Weight	.	.	.	.	1791.1	1791.1
Chalcedony							
	Count	38	11	3	.	.	52
	Weight	28.1	10.2	76.0	.	.	114.3
Rhyolite							
	Count	18	.	.	.	.	18
	Weight	15.7	.	.	.	.	15.7
Igneous/Metamorphic							
	Count	6	5	1	1	1	14
	Weight	37.8	90.4	4.1	29.9	1.6	163.8
Ironstone							
	Count	11	.	2	.	.	13
	Weight	8.1	.	50.9	.	.	59.0
Indeterminate							
	Count	76	3	.	4	2	85
	Weight	32.6	8.6	.	0.6	0.5	42.3
TOTAL	Count	4,598	1,279	72	44	92	6,085
	Weight	2,423.2	3,556.4	539.4	90.7	1,794.4	8,404.1

* A = absent; C = cobble; B = block; I = indeterminate; X = no observation.

of cortex represented, but artifacts with cobble cortex far outnumber those with block cortex. This relationship can be expressed as the ratio of block cortex to cobble cortex: jasper 1:20, chert 1:13, quartz (vein and crystal) 1:41, quartzite 1:10, chalcedony 1:4, and igneous/metamorphic 1:5. The presence of block and cobble cortex indicates that both primary and secondary sources were exploited, but the ratios show that secondary (cobble) sources were exploited more frequently than primary sources. This pattern is certainly not unexpected, given that the site is located a considerable distance from the Fall Line (Figure 15). The quartz assemblage most strongly expresses this pattern of local procurement: for every quartz artifact with block cortex there are 41 with cobble cortex. There are only five quartz artifacts with block cortex (one of which is crystal quartz). Therefore, it appears that quartz was almost exclusively procured in cobble form from local deposits. In contrast, ironstone artifacts only possess block cortex, and rhyolite artifacts possess no cortex (Table 13).

In the debitage assemblage (Table 14), similar ratios are seen: jasper 1:19, chert 1:12, quartz 1:48, quartzite 1:12, chalcedony 1:4, and igneous/metamorphic 1:4. As above, ironstone is only represented by block cortex, and rhyolite lacks cortex of any kind.

Certainly then, cobble sources were exploited much more frequently than bedrock sources, especially for the most commonly used raw materials--jasper, chert, quartz, and quartzite. It is necessary, however, to consider what proportion of each raw material type possesses cortex because, like mean weight, it can be argued that cortex should become less common as distance from a source increases. In terms of this study, bedrock sources clearly are more distant than cobble sources.

The proportion of cortex to no cortex is expressed for the main raw material types as the ratio of the number of artifacts with cortex (any type) to the number of artifacts without cortex: jasper 1:3, chert 1:4, quartz 1:3, and quartzite 1:5. The ratios are rather consistent; for each artifact with cortex there are three, four, or five artifacts without cortex. The debitage assemblage contains similar ratios for these same raw materials. As a whole, the chipped-stone assemblage has a ratio of 1:3. Stated another way, 23 percent of the chipped-stone artifacts possess some form of cortex, and of the cortex represented, 92 percent is cobble cortex, 5 percent is block cortex, and 3 percent is indeterminate cortex. In turn, 77 percent of the chipped-stone artifacts lack cortex. This is a fairly high percentage rate, which supports the notion that raw material sources (of any kind) were not close by, and it can be taken as support for the notion that the raw material for many of the artifacts without cortex may have been procured from primary sources at or above the Fall Line.

This latter statement cannot be easily confirmed, because if an artifact lacks cortex it is not easily determined whether that artifact is derived from a cobble or bedrock source. Nonetheless, it does seem likely that more than 72 artifacts--those that possess block cortex (Table 13)--was procured from primary sources. Yet it cannot be determined exactly how many more than that were derived from such sources.

The issue of bedrock resources is important; Lowery and Custer (1990), in analyzing the Early Archaic lithic assemblage from the Crane Point Site in nearby Maryland, argue for the almost exclusive use of primary lithic sources, with these materials being transported onto the Delmarva Peninsula as bifacial cores. As just discussed, at Site 7S-F-68 there is little hard evidence that bedrock sources were intensively exploited; at best, it can be speculated that both bedrock and cobble sources were equally exploited.

Early Archaic lithic procurement is discussed below, but before leaving this issue, it is important to note that the ratio of artifacts with cortex to those without cortex for the debitage assemblage from Site 7S-F-68 is identical to that obtained for Crane Point Site: namely, 1:3. In addition, when the presence of cortex is expressed as a percentage, they are within three points of each other: 22 percent of the debitage at Site 7S-F-68 possess cortex, and 25 percent of the debitage at the Crane Point Site possess cortex. The three most common raw materials in both debitage assemblages are jasper, chert, and quartz (Lowery and Custer 1990:table 3).

c) *Patterns of Procurement*

The question to be addressed is, How did lithic procurement change through time at the site? Special attention is given to Early Archaic procurement. Two data sets are best suited to examine this question, the temporally diagnostic bifaces and the lithic materials assigned to the Early, Middle, and Late analytical units (see previous chapter for unit designations). The bifaces are discussed first.

As discussed in the previous chapter, 76 projectile points were recovered from the site (Table 10), 34 of which are assigned to cultural components (Table 11). A possible fluted point component is represented by a late-stage biface manufactured from crystal quartz, which is believed to be a fluted point production failure (Plate 6). In addition, a crystal quartz point tip was recovered from the surface of the site, and it resembles the tip of a resharpened fluted point both in shape and flaking patterns. It is noteworthy that the three fluted points recovered from the Higgins Site in Maryland are manufactured from crystal and vein quartz (Ebright 1992) and that a number of crystal quartz fluted points have been recovered from the Williamson Site in Virginia (Peck 1985). Because no other diagnostic artifacts in the Site 7S-F-68 assemblage are made from crystal quartz, it can be argued that all 35 crystal quartz tools and debitage in the assemblage belong to the fluted point component. A biface-reduction flake used as a cutting tool is shown in Plate 15.

Also recovered from the surface is a possible late Paleoindian lanceolate point made from jasper (Plate 7). Little else can be said about this possible component.

As a group, the 19 Early Archaic points are manufactured primarily from cryptocrystallines (Plates 8-10): 8 jasper, 6 chert, 2 vein quartz, 2 quartzite, and 1 chalcedony. Jasper and chert account for 74 percent of these early points, a pattern that is typical for the Delmarva Peninsula (Custer 1984). Because 86 percent of all chert points and 57 percent of all jasper points are Early Archaic point types, it is reasonable to argue that the majority of the chert and jasper tools and debitage are products of the Early Archaic component, especially the endscrapers and sidescrapers (Plates 16 and 17). Also, the only diagnostic points manufactured from vein quartz are Early Archaic (e.g.,

TABLE 14: SUMMARY OF CORTEX TYPES BY RAW MATERIAL FOR DEBITAGE

RAW MATERIAL		CORTEX TYPE* A	C	B	I	X	TOTAL
Jasper							
	Count	2,495	739	39	15	.	3,288
	Weight	614.4	709.1	35.1	10.4	.	1,369.0
Chert							
	Count	919	188	16	10	1	1,134
	Weight	237.8	208.6	67.8	12.1	1.2	527.5
Quartz							
	Count	621	191	4	6	.	822
	Weight	510.7	430.7	7.9	3.6	.	952.9
Quartzite							
	Count	300	46	4	3	.	353
	Weight	637.6	278.2	6.1	5.9	.	927.8
Argillite							
	Count	.	.	.	.	73	73
	Weight	.	.	.	.	171.2	171.2
Chalcedony							
	Count	34	11	3	.	.	48
	Weight	10.0	10.2	76.0	.	.	96.2
Rhyolite							
	Count	16	.	.	.	.	16
	Weight	6.0	.	.	.	.	6.0
Igneous/Metamorphic							
	Count	5	4	1	.	.	10
	Weight	10.5	34.8	4.1	.	.	49.4
Ironstone							
	Count	11	.	1	.	.	12
	Weight	8.1	.	2.5	.	.	10.6
Indeterminate							
	Count	76	2	.	4	2	84
	Weight	32.6	0.7	.	0.6	0.5	34.4
TOTAL	Count	4,477	1,181	68	38	76	5,840
	Weight	2,067.7	1,672.3	199.5	32.6	172.9	4,145.0

* A = absent; C = cobble; B = block; I = indeterminate; X = no observation.

Plate 10:c); thus, it can be argued that most of the vein quartz tools and debitage are products of the Early Archaic component. This same argument can be made for quartzite (Table 11).

Following Ebright's work at the Higgins Site (1992), the Otter Creek point in the Site 7S-F-68 assemblage is considered Middle Archaic, and like many of the Otter Creek points at the Higgins and Indian Creek V sites (LeeDecker et al. 1991), it too is manufactured from rhyolite. In fact, it is highly probable that all 18 rhyolite artifacts from the site belong to the Otter Creek component because no other diagnostic artifacts are made from rhyolite.

The heterogeneous group of 12 stemmed points that are believed to represent a Late Archaic/Early Woodland component are primarily made from argillite (Plates 12-14): 7 argillite, 4 jasper, and 1 chert. As discussed in the preceding chapter, while it is likely that several different components are represented by the stemmed points, it is significant that the use of argillite is restricted to stemmed points. In other words, earlier points are not made from argillite, and the importance of this pattern has been discussed by Custer (1984, 1986b, 1988). Thus, it is likely that all of the argillite tools and debitage in the assemblage are part of the Late Archaic/Early Woodland component. However, it is puzzling that the large argillite biface (Feature 33) recovered from the site

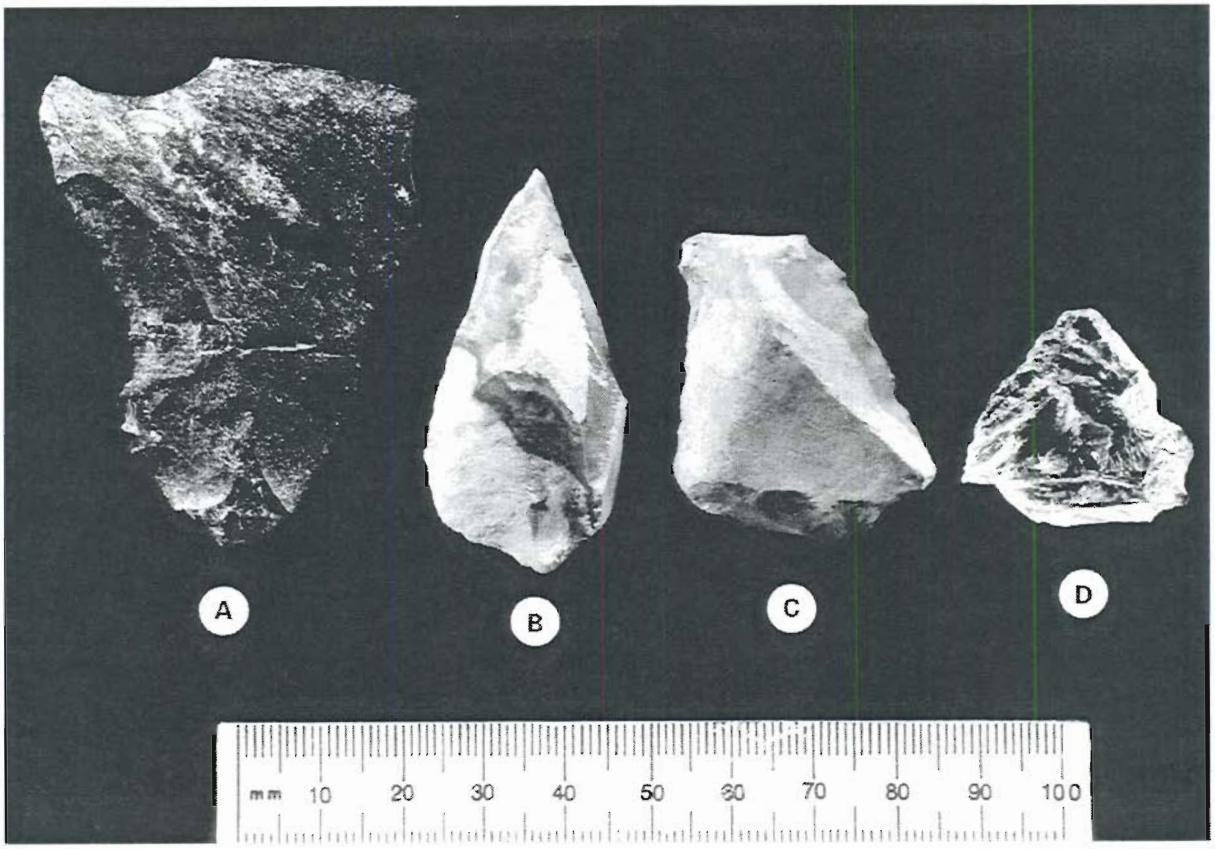


PLATE 15: Flake Tools. A: Retouched Flake, Chert, Cat. No. 11 (Shovel Test N106/E100, Stratum B); B: Retouched Flake, Jasper, Cat. No. 158 (Excavation Unit 14, Stratum B, Level 3); C: Retouched Flake, Jasper, Cat. No. 1231 (Excavation Unit 50, Stratum A, Level 1); D: Utilized Flake, Quartz Crystal, Cat. No. 1354 (Excavation Unit 51, Stratum B, Level 5).

was found below the argillite stemmed points (Plate 18).

The Late Woodland component is represented by a single triangular arrowpoint manufactured from jasper that was recovered from the upper levels of the site. This point is undoubtedly part of the same component that deposited the small sample of Townsend/Rappahannock ceramics at the site, and it is likely that a limited number of jasper tools and debitage were deposited at the site by this component.

In review, change through time is evident in the biface assemblage: the possible fluted point component utilized crystal quartz; the Early Archaic component primarily utilized jasper and chert; the Otter Creek component (Middle Archaic) utilized rhyolite; the Late Archaic/Early Woodland component used more argillite than any other raw material; and the Late Woodland component utilized jasper. Rhyolite and argillite are the only raw materials that are not available on the Delmarva Peninsula. In addition, it is likely that quartz crystals were obtained from sources at or above the Fall Line.

Analysis of patterns in raw material use may also be carried out for the Early, Middle, and Late analytical units (AUs). These units contain larger sample sizes and include other artifact types in addition to diagnostic bifaces, but they are coarser temporal units and exhibit clear evidence of mixing, as may be seen in the distribution of point types (Table 15). It is significant that, while the Middle and Late AUs contain a mixture of point types, the Early AU contains, with two exceptions only Early Archaic points; the exceptions are two Late Archaic/Early Woodland stemmed points, one of which is made from jasper and could be classified as a Morrow Mountain point (Plate 12:a). Consequently, Early Archaic procurement is emphasized in the ensuing discussion.

If the Early AU is representative of an Early Archaic occupation, it should be dominated by jasper, chert, vein quartz, and quartzite. This is certainly the case (Table 16). However, although jasper and chert are

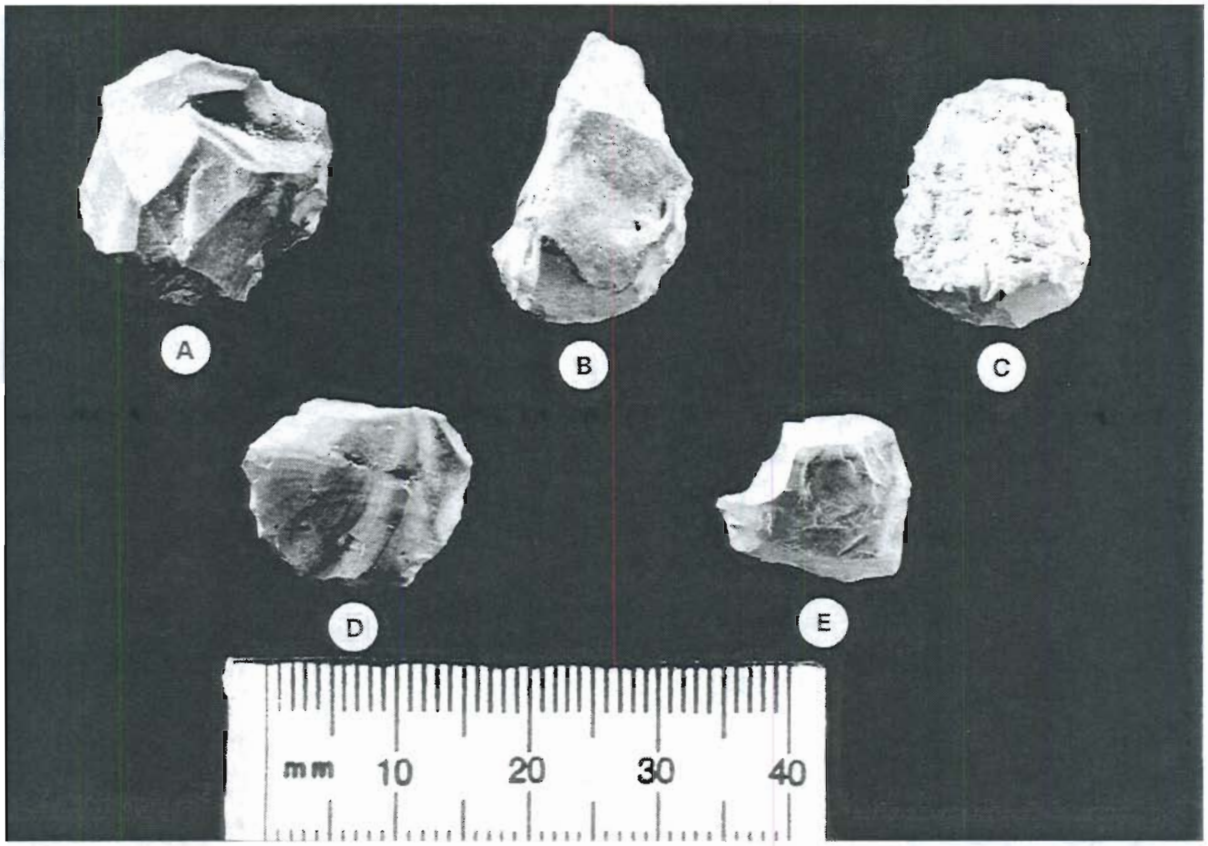


PLATE 16: Endscrapers. A: Chert, Cat. No. 1121 (Excavation Unit 23, Stratum A, Level 1); B: Jasper, Cat. No. 354 (Excavation Unit 33, Stratum B, Level 8); C: Jasper, Cat. No. 240 (Excavation Unit 20, Stratum B, Level 3); D: Jasper, Bear Family-Level Blood Residue, Cat. No. 262 (Excavation Unit 22, Stratum B, Level 2); E: Jasper, Cat. No. 125 (Test Unit 12, Stratum B, Level 5).

dominant raw materials in the Middle and Late AUs as well, vein and crystal quartz and quartzite are most common in the Early AU, supporting the early use of these materials. The popularity of jasper and chert in the Middle and Late AUs may, in part, be explained by the use of local cobbles for flake tools. Mixing of the deposits is an additional explanation, and in this case, one would expect to find little argillite in the Early AU. Nonetheless, there are only 12 more pieces of argillite in the Middle AU than in the Early AU, and by weight, there is more argillite in the Early AU than in the Middle AU (Table 16). If the weight of the large argillite biface (1491.0 g) contained in the Early AU is subtracted from the total argillite weight for the Early AU, this total comes much closer to the argillite total for the Middle AU, but it is still larger (Early AU 146.7 g and Middle AU 114.3 g). At this time, it is believed that the presence of argillite in the Early AU is the result of mixing. Of course, it is possible that argillite was utilized by the Early Archaic occupants of the site, but this seems unlikely because no Early Archaic points in the assemblage are manufactured from this material. Moreover, Custer (1984) reports few Early Archaic points manufactured from argillite.

Even if there is some mixing of materials, it is likely that the majority of the jasper, chert, vein quartz, and quartzite in the Early AU is related to the Early Archaic occupation. Thus, the issue of Early Archaic lithic procurement can be examined with the cortex totals in Table 17. As with the rest of the assemblage, block cortex is poorly represented. This pattern can be expressed as the ratio of block cortex to cobble cortex: jasper 1:25, chert, 1:13, and vein quartz 1:102 (no block cortex for quartzite). For these materials combined, the ratio of cortex to no cortex is 1:4, which is similar to the overall assemblage. Cobble cortex is common because cobble sources are more readily available than bedrock sources. As already discussed, however, because bedrock sources are more distant, it is more likely that artifacts made from bedrock lithics will retain less cortex than artifacts made from cobble lithics. But, again, if an artifact lacks cortex it is difficult to determine if that artifact was made from a cobble or bedrock block.

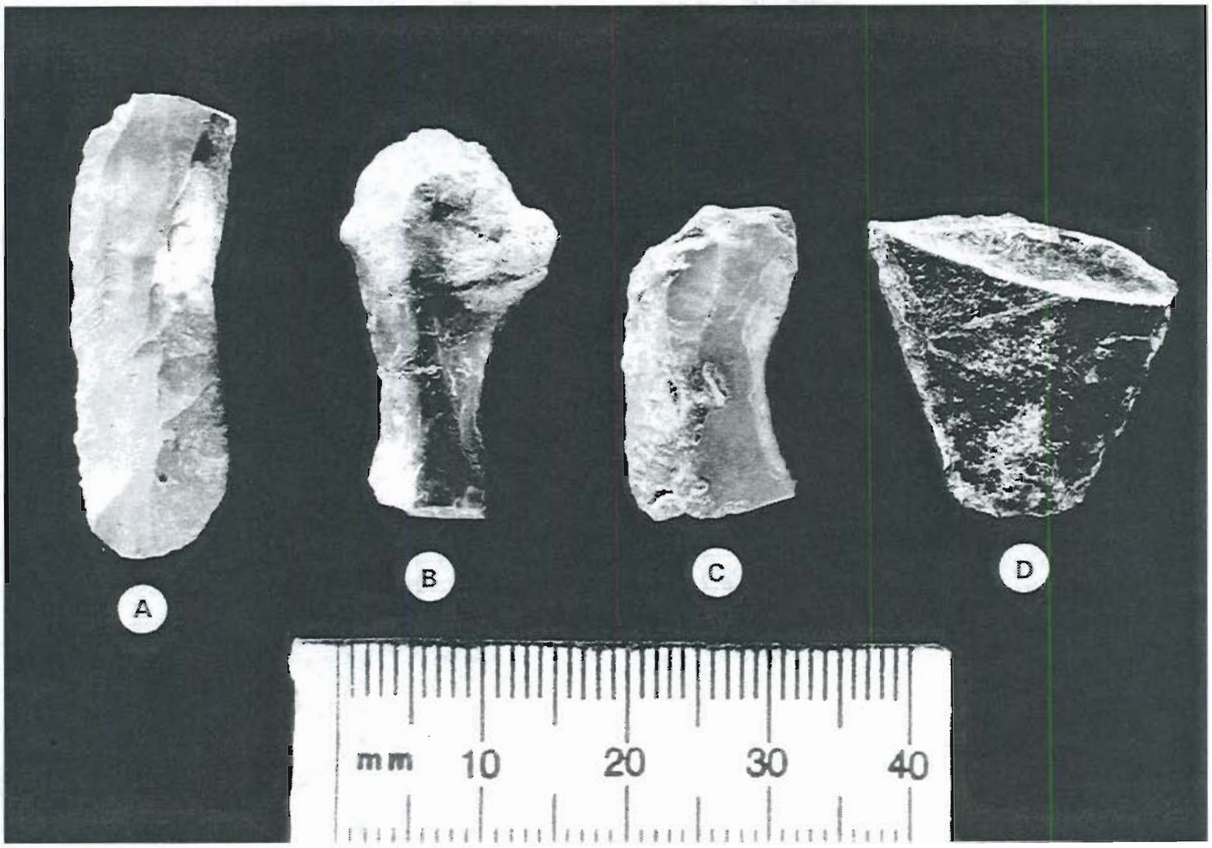


PLATE 17: Side Scrapers. A: Jasper, Cat. No. 610 (Excavation Unit 27, Stratum B, Level 6); B: Chert, Cat. No. 565/1085 (Excavation Unit 21, Wall Collapse and Excavation Unit 18, Stratum B, Level 3); C: Jasper, Cat. No. 558 (Excavation Unit 21, Stratum , Level 5); D: Chert, Cat. No. 982 (Excavation Unit 52, Stratum B, Level 2).

Following the arguments made by Lowery and Custer (1990), if bedrock lithics were transported to the site by Early Archaic groups, it is most likely that these materials would have arrived in the form of bifaces. No Early Archaic points possess cortex, but if the entire biface assemblage is examined, it is clear that block cortex is poorly represented: 3 block, 21 cobble, and 2 indeterminate. Only one of the bifaces with block cortex is made from jasper; the other two are made from quartzite and ironstone. The bifaces with cobble cortex are made from jasper (9), chert (7), vein quartz (4), and quartzite (1). Similarly, only one uniface possess block cortex, and it is made from crystal quartz (Plate 15:d).

Consequently, there is little hard evidence of intensive exploitation of bedrock lithic sources at the site. This statement holds true for the entire assemblage, as well as for the Early Archaic component. It is likely that bedrock sources were exploited, but it is problematic to assert that lack of cortex is evidence to indicate bedrock procurement, especially if similar raw materials are locally available in secondary deposits. If bedrock sources were heavily relied upon by Early Archaic groups living on the Delmarva Peninsula, considerable retooling (with cobble lithics) had apparently occurred by the time these groups reached the site. If suitable raw materials are available in cobble form, it seems reasonable to assume that Early Archaic groups would have taken advantage of these local resources. It appears, too, that later groups also used these local cobble resources. But Middle Archaic (Otter Creek) people and Late Archaic/Early Woodland people brought nonlocal raw materials--rhyolite and argillite, respectively--onto the peninsula. This also seems to be the case for the fluted point component, with its utilization of crystal quartz.

In conclusion, it appears that the Early Archaic occupants of the site primarily used local cobbles for chipped-stone tool production. But this does not mean that they did not utilize bedrock sources situated at or above the Fall Line. If these lithic sources were exploited, it appears that the Early Archaic assemblage from Site 7S-F-68 could be said to represent a locally "retooled" assemblage. Hence, the Site 7S-F-68 assemblage may be more like the lithic assem

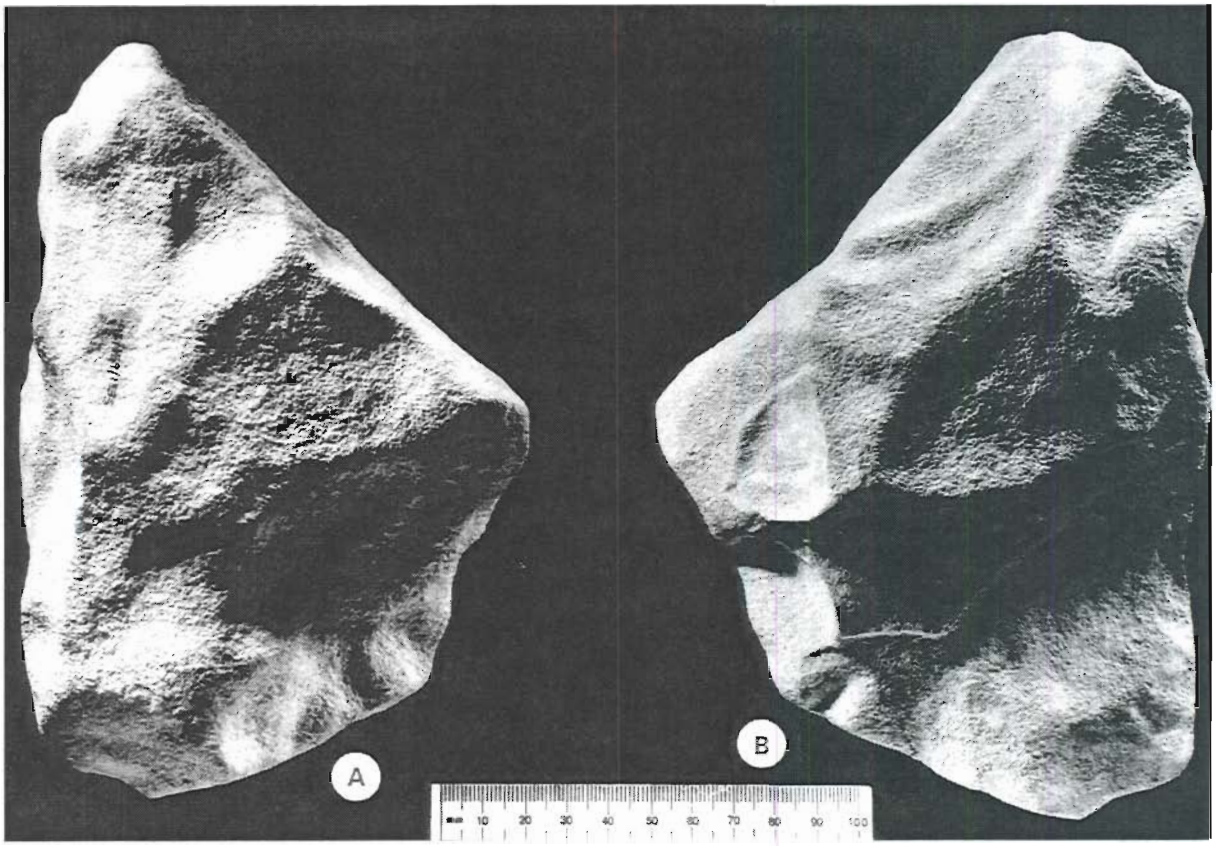


PLATE 18: Early Stage Biface, Argillite, Cat. No. 1335 (Excavation Unit 41, Feature 33,). A: Obverse; B: Reverse.

blage from the Paw Paw Cove Site in Maryland (Lowery 1989) than like the Crane Point Site: as they are characterized by Lowery and Custer (1990:115), "At Paw Paw Cove, lithic resources in the tool kits were clearly depleted and it was necessary for these groups to exploit any available local cobble resources. On the other hand, groups at Crane Point had a much less depleted tool kit and did not have to exploit secondary sources to as great an extent as the groups at Paw Paw Cove." However, as noted earlier, the debitage assemblage from Site 7S-F-68 is very similar to the debitage assemblage from the Crane Point Site, both in raw materials and frequency of cortex. If the above interpretations are correct, similar cortex frequencies would not be expected. This issue requires further study, which is beyond the scope of this report. The main point to be made is that Early Archaic groups on the Delmarva Peninsula utilized cobble resources, and data from Site 7S-F-68 indicate that these secondary sources were exploited more intensively than bedrock sources because secondary sources were closer and because they contained cryptocrystallines (chert and jasper).

E. LITHIC INDUSTRIES AND SITE ACTIVITIES

The lithic assemblage is made up of 6,409 artifacts that have been assigned to various tool and debris types that are believed to be indicative of specific activities or behaviors that take place at Site 7S-F-68. Related types are grouped into eight classes: bifaces, unifaces, cores, debitage, groundstone, cobble tools, cracked rock, and minerals. In the following discussion specific tool and debris types are first considered by class, and attempts are then made to reconstruct site activities and the arrangement of these activities.

1. *Artifact Classes*

a) *Bifaces*

In total, 125 bifaces were recovered, 68 percent of which were manufactured from jasper and chert (Table 10). Sixty percent of the bifaces are projectile points, and 14 percent are unfinished points, most of which appear to be production failures and rejects. The low number of failures and rejects supports earlier statements about the site's considerable distance from significant raw material sources. The production failures and rejects are manufactured from jasper (5), chert (5),

Table 15: Summary of Projectile Points by Analytical Units

ANALYTICAL UNITS/ POINT TYPES	RAW MATERIAL JASPER	CHERT	ARGIL-LITE	QUARTZ	QUART-ZITE	CHAL-CEDONY	RHYO-LITE	TOTALS
EARLY AU								
Generalized Early Archaic	.	1	.	1	.	.	.	2
Kirk Corner Notched	1	.	.	.	.	.	.	1
Kirk Stemmed	.	1	.	.	.	1	.	2
Bifurcate Base	1	2	.	.	.	.	.	3
Late Archaic/E. Woodland	1	.	1	.	.	.	.	2
SUBTOTAL	3	4	1	1	.	1	.	10
MIDDLE AU								
Generalized Early Archaic	2	.	.	.	.	.	.	2
Kirk Stemmed	1	.	.	.	1	.	.	2
Bifurcate Base	1	1	.	.	.	.	.	2
Otter Creek	.	.	.	.	.	.	1	1
Late Archaic/E. Woodland	2	1	4	.	.	.	.	7
Late Woodland	1	.	.	.	.	.	.	1
SUBTOTAL	7	2	4	.	1	.	1	15
LATE AU								
Palmer	1	.	.	.	.	.	.	1
Kirk Stemmed	.	1	.	.	1	.	.	2
Late Archaic/E. Woodland	.	.	1	.	.	.	.	1
SUBTOTAL	1	1	1	.	1	.	.	4
TOTALS	11	7	6	1	2	1	1	29

quartz (5), argillite (2), and quartzite (1). Several of the bifaces appear to have been used as scrapers and/or knives after they failed (broke) or were rejected (Plate 19). Thirty-four of the 76 finished points were assigned to point types (Table 11) and have already been discussed. The length, width, and thickness of intact points are summarized in Table 12.

Four bifaces deserve special mention because they do not readily fit into the above types. The first specimen is the very large early-stage argillite biface that was recovered from Feature 33. Because of its irregular outline and flaking pattern, it might be more accurate to describe this specimen as a crude bifacial core or as a block of argillite that has been bifacially worked (Plate 18). Given the large size of several of its flake scars, it is possible that large flakes were detached from it to make argillite stemmed points. The last three specimens were classified as "other bifaces" (Table 10): one is a crudely flaked quartzite block that may have functioned as a chopper; the other two are believed to be hoe blades or grubbing tools (e.g., Broyles 1971:figure 32). The intact hoe blade is manufactured from a large quartzite cobble (Plate 20), while the fragmentary example is manufactured from a slab of ironstone and represents the bit end of a hoe blade. That both specimens exhibit some degree of edge rounding and polishing on their bits supports the notion that they were digging tools. An alternative explanation is that they functioned as high-duty scrapers.

b) *Unifaces*

Sixty-six unifaces were recovered: 25 retouched flakes, 24 utilized flakes, 10 endscrapers, 6 sidescrapers, and 1 denticulate (Plates 15-17). Expedient unifaces--utilized flakes and retouched flakes--are the most common and are manufactured from jasper (31), chert (11), chalcedony (2), quartz (1), argillite (1), igneous/metamorphic material (1), and indeterminate material (1). Given the analytical methods that were employed, it is likely that many briefly used flakes were not identified as utilized flakes but were simply recorded as debitage. This detection problem is probably most severe in the quartz assemblage because edge utilization is difficult to detect on quartz. Similar detection problems occur with argillite, but in this case, detection of utilization is hindered by erosion.

TABLE 16: COUNT, WEIGHT, AND MEAN WEIGHT OF RAW MATERIAL TYPSE FOR ALL CHIPPED-STONE ARTIFACT CLASSES BY ANALYTICAL UNITS

ANALYTICAL UNITS/RAW MATERIALS	Count	Weight	Mean Weight
EARLY AU			
Jasper	1121	695.7	0.6
Chert	488	282.1	0.6
Vein Quartz	438	889.4	2.0
Quartzite	239	1412.5	5.9
Argillite	33	1637.7	49.6
Chalcedony	22	90.9	4.1
Rhyolite	8	0.8	10.0
Crystal Quartz	25	11.9	0.5
Igneous/Metamorphic	10	132.9	13.3
Ironstone	4	0.7	0.2
Indeterminate	50	30.5	0.6
SUBTOTAL	2438	5185.1	2.1
MIDDLE AU			
Jasper	1551	717.4	0.5
Chert	479	282.0	0.6
Vein Quartz	255	300.3	1.2
Quartzite	88	274.2	3.1
Argillite	45	114.3	2.5
Chalcedony	18	19.0	1.1
Rhyolite	9	13.7	1.5
Crystal Quartz	7	1.8	0.3
Igneous/Metamorphic	4	30.9	7.7
Ironstone	6	7.3	1.2
Indeterminate	22	5.8	0.3
SUBTOTAL	2484	1766.7	0.7
LATE AU			
Jasper	569	416.2	0.7
Chert	134	93.8	0.7
Vein Quartz	92	112.1	1.2
Quartzite	28	123.3	0.4
Argillite	5	18.2	3.6
Chalcedony	9	4.0	0.4
Rhyolite	1	1.2	1.2
Ironstone	1	2.5	2.5
Indeterminate	12	4.9	0.4
SUBTOTAL	851	776.2	0.9
GRAND TOTAL	6,085	8,404.1	1.4

Note: all weights expressed in grams.

The endscrapers are manufactured from either jasper (6) or chert (4), and the sidescrapers are manufactured from chert (3), jasper (2), and quartz (1). The denticulate is manufactured from jasper. Based upon their morphology, several of the endscrapers and sidescrapers could belong to the Early Archaic component or to the possible Paleoindian component.

c) *Cores*

The lithic assemblage contains a total of 54 cores, which are divided between three types: 41 bipolar cores, 6 freehand cores, and 7 tested cobbles (Plates 21 and 22). Bipolar cores have the lowest mean weight (5.3 g), followed by freehand cores (22.0 g) and tested cobbles (57.8 g) (Table 18). These differences in weight are expected because the bipolar cores were intensively reduced, and the tested cobbles were rejected from reduction after the removal of several test flakes. Bipolar reduction is a technique for maximizing available raw materials, particularly small cobbles (Flenniken 1981; Hayden 1980). Consequently, the large number of bipolar cores is consistent with raw material scarcity. The tested cobbles are manufactured from jasper (3), chert (2), quartz (1), and quartzite (1); the bipolar cores are manufactured from jasper (21), quartz (13), and chert (7); the freehand cores are manufactured from quartz (3), jasper (1), chert (1), and basalt (1). The basalt

TABLE 17: SUMMARY OF CORTEX TYPES BY RAW MATERIAL FOR THE CHIPPED-STONE ASSEMBLAGE EARLY ANALYTICAL UNIT

		CORTEX TYPE*					
RAW MATERIAL		A	C	B	I	X	TOTAL
Jasper							
	Count	851	254	10	6	.	1,121
	Weight	253.8	423.7	13.8	4.4	.	695.7
Chert							
	Count	398	79	6	5	.	488
	Weight	148.9	75.9	55.8	1.5	.	282.1
Vein Quartz							
	Count	332	102	1	3	.	438
	Weight	311.3	574.9	0.1	3.1	.	889.4
Quartzite							
	Count	207	29	.	3	.	239
	Weight	517.1	889.5	.	5.9	.	1,412.5
Argillite							
	Count	.	.	.	.	33	33
	Weight	.	.	.	.	1,637.7	1,637.7
Chalcedony							
	Count	17	3	2	.	.	22
	Weight	14.4	1.5	75.0	.	.	90.9
Crystal Quartz							
	Count	24	.	1	.	.	25
	Weight	6.3	.	5.6	.	.	11.9
Rhyolite							
	Count	8	.	.	.	.	8
	Weight	0.8	.	.	.	.	0.8
Igneous/Metamorphic							
	Count	4	4	1	1	.	10
	Weight	10.0	88.9	4.1	29.9	.	132.9
Ironstone							
	Count	4	.	.	.	.	4
	Weight	0.7	.	.	.	.	0.7
Indeterminate							
	Count	49	1	.	.	.	50
	Weight	22.6	7.9	.	.	.	30.5
TOTAL	Count	1,894	472	21	18	33	2,438
	Weight	1,285.9	2,062.3	154.4	44.8	1,637.7	5,185.1

* A = absent; C = cobble; B = block; I = indeterminate; X = no observation.

core may actually represent a groundstone celt or axe fragment that was recycled into a core (Plate 22:c).

None of the cores possess block cortex. The dominance of cobble cortex in the core assemblage, as well as in the entire chipped-stone assemblage, and the presence of tested cobbles of jasper, chert, quartz, and quartzite clearly indicate that the inhabitants of the site secured large numbers of cobbles from somewhere on the Delmarva Peninsula. If a sizable deposit of cobbles were located, it is likely that it would--like a primary lithic source--have been exploited at regular intervals because it would have been a predictable source of raw material (see Custer and Galasso 1980). Minor cobble deposits, on the other hand, may have been checked for usable cobbles only when individuals passed by, or stumbled onto, such deposits during the course of other activities (e.g., hunting). Apparently, some cobbles were brought to the site before they were even tested.

d) *Debitage*

The debitage assemblage is made up of 5,840 specimens that have been sorted into eight different types of flakes and shatter (Table 19). Jasper and chert account for 76 percent of the assemblage by count and 46 percent by weight. Each raw material's debitage assemblage has already been discussed in terms of cortex and mean weight. Cortex types are summarized in Table 14. Also, it has been noted that the debitage assemblage undoubtedly contains flakes and pieces of shatter that were used as expedient tools.

The jasper assemblage includes 198 decortication flakes, 830 early-reduction flakes, 20 bipolar flakes, 716 biface-reduction flakes, 1,298 flake fragments,

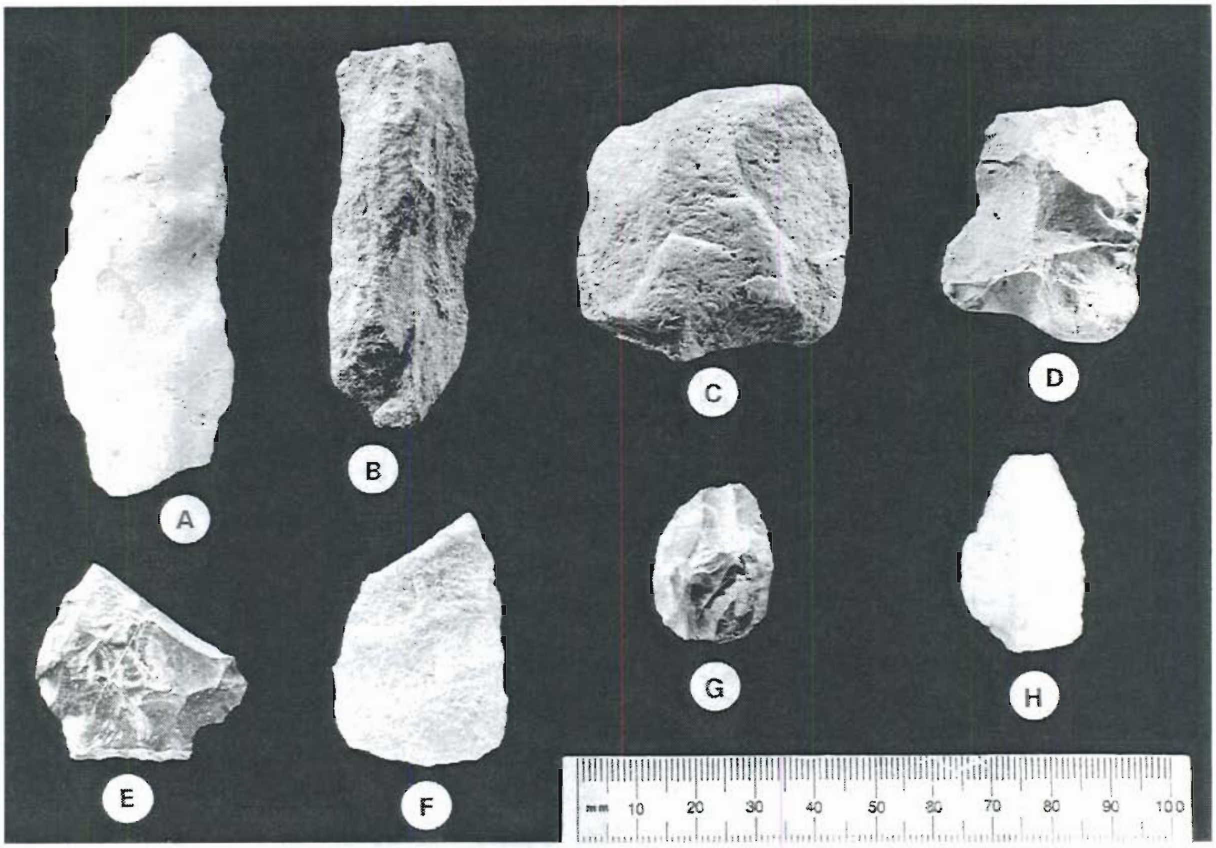


PLATE 19: Assorted Bifaces. A: Middle Stage Biface, Quartz, Cat. No. 50 (Test Unit 1, Stratum B, Level 7); B: Indeterminate Biface, Schist, Cat. No. 550 (Excavation Unit 21, Stratum B, Level 3); C: Middle Stage Biface, Argillte, Cat. No. 297 (Excavation Unit 28, Stratum B, Level 4); D: Early Stage Biface, Jasper, Cat. No. 886 (Excavation Unit 45, Stratum B, Level 5); E: Late Stage Biface, Jasper, Cat. No. 177 (Excavation Unit 16, Stratum B, Level 4); F: Late Stage Biface, Quartzite, Cat. No. 554 (Excavation Unit 21, Stratum B, Level 4); G: Middle Stage Biface, Possible Scraper, Jasper, Deer Family-Level Blood Residue, Cat. No. 68 (Test Unit 5, Stratum B, Level 6); H: Indeterminate Biface, Quartz, Deer Family-Level Blood Residue, Cat. No. 926 (Excavation Unit 40, Stratum B, Level 2).

176 pieces of block shatter, and 50 pieces of flake shatter. The relationship between these different types is expressed as percentages and is graphically presented in Figure 16a. The nearly equal numbers of early-reduction flakes and biface-reduction flakes indicate that, in addition to some level of flake-tool production, both biface production and maintenance (resharpening) were common activities. Similar patterns are evident in the chert assemblage (Table 19 and Figure 16b). The quartz assemblage differs in its lower number of biface flakes and its greatly increased number of pieces of block shatter (Figure 16c). These differences are products of their differing fracture mechanics--that is, quartz shatters more readily than chert and jasper. In addition, it is likely that quartz was more frequently used for flake-tool production than for biface production. But only a limited number of quartz unifaces were identified. This discrepancy, however, can be partly explained by how difficult it is to detect use-wear on quartz flakes. The quartzite assemblage differs from the other three raw material assemblages in that it possesses large numbers of early-reduction flakes (Figure 16d), a pattern that suggests both flake-tool production and early- to middle-stage biface production.

Rhyolite is represented only by biface flakes and flake fragments, while argillite is represented by these types and by early-reduction flakes (Table 15). The latter flakes are seen as support for the notion that argillite was procured under different circumstances than rhyolite (i.e., exchange versus embedded procurement).

e) *Groundstone Tools*

The only definite groundstone tool recovered is a tiny piece of steatite (0.7 g) that was once part of a stone

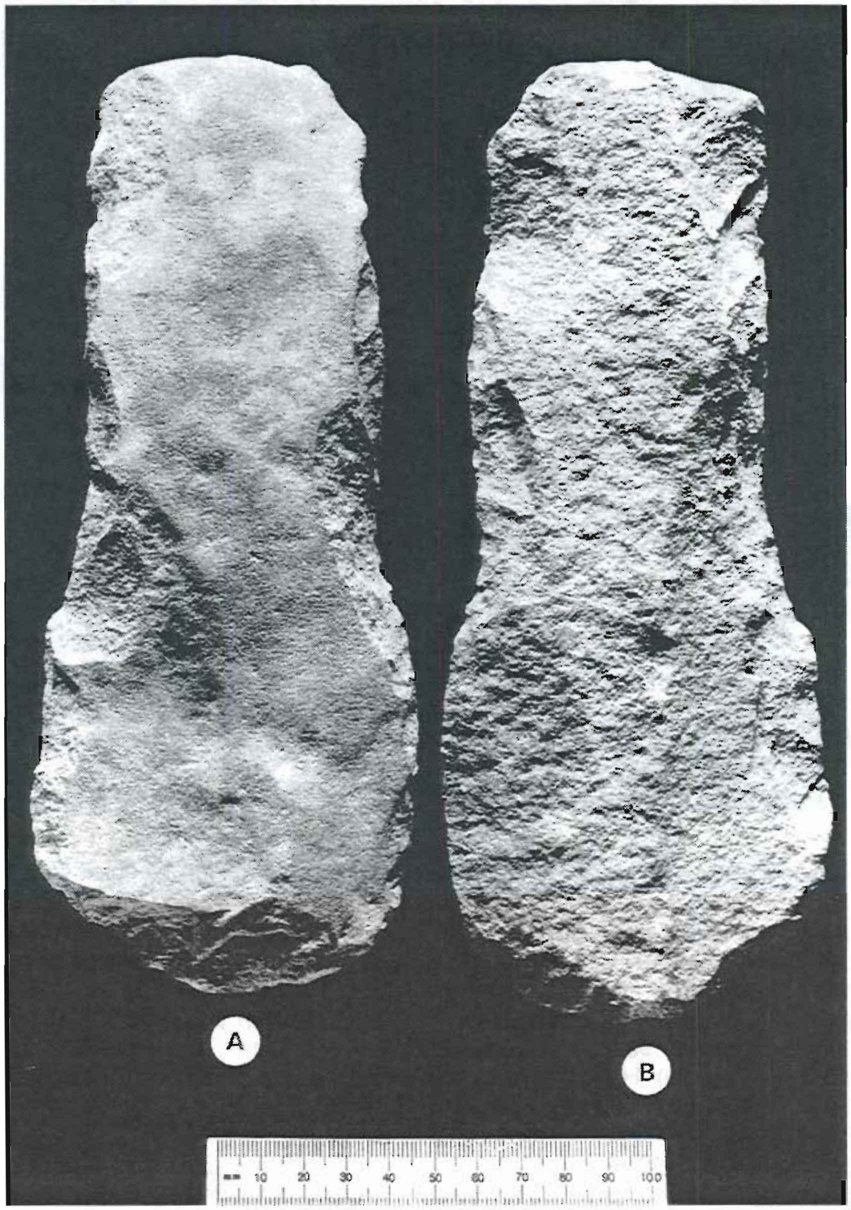


PLATE 20: Hoe Blade, Quartzite, Cat. No. 541 (Excavation Unit 48, Feature 21). A: Obverse; B: Reverse.

vessel or some type of ornament. A possible groundstone tool is the previously discussed freehand core that may be a recycled celt or axe.

f) *Cobble Tools*

Seventeen cobble tools were recovered: 1 abrader, 1 metate, 1 anvilstone, 2 pestles, 2 manos, 2 pitted cobbles, 7 hammerstones, and 1 cobble that may have been used as a chopper. The majority of these simple tools are made from quartzite cobbles, and it is likely that these cobbles were collected from the same deposits as those of the chert and jasper cobbles used in chipped-stone tool production. Cobble tools not made from quartzite include a sandstone abrader, a siltstone pestle, a basalt metate, and a quartz hammerstone. Most of these cobbles were probably collected from the same deposits as the quartzite cobbles (e.g., Plate 23), except for the two largest tools, the basalt metate and the siltstone pestle (Plates 24 and 25). These tools may have been brought to the site from sources near the Fall Line because it is uncertain if cobbles of this size are available on the Delmarva Peninsula.

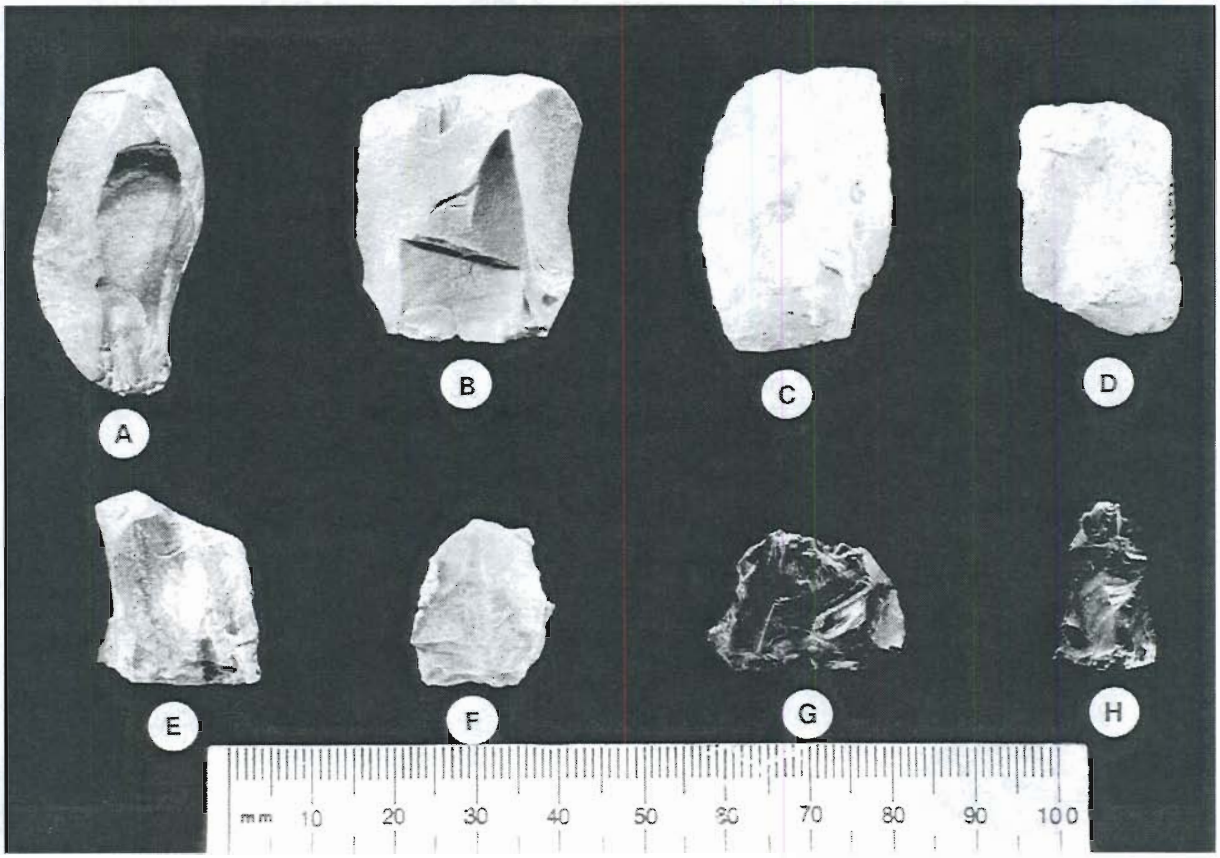


PLATE 21: Bipolar Cores. A: Jasper, Cat. No. 48 (Test Unit 1, Stratum B, Level 5); B: Jasper, Cat. No. 678 (Excavation Unit 31, Stratum B, Level 4); C: Quartz, Cat. No. 49 (Test Unit 1, Stratum B, Level 6); D: Quartz, Cat. No. 727 (Excavation Unit 49, Stratum B, Level 5); E: Chert, Cat. No. 99 (Test Unit 9, Stratum B, Level 2); F: Jasper, Cat. No. 1114 (Excavation Unit 18, Feature 8); G: Jasper, Cat. No. 114 (Test Unit A, Stratum A, Level 1); H: Chert, Cat. No. 592 (Excavation Unit 27, Stratum B, Level 2).

Two cobble tools found in close association (Feature 22) may represent a plant processing unit, a mano (Plate 25:a) and a metate (Plate 24). Eight cobble tools clearly served several functions (e.g., Plates 23-24), and two cobble tools were used as cooking and heating stones and thus ended up as cracked cobbles in the FCR assemblage (Plate 26). That cobbles served several functions and were recycled into cooking stones is seen as additional evidence of the paucity of lithic raw materials in the site area.

g) *Cracked Rock*

Recovered from the site were 273 pieces of cracked rock, weighing a total of 6,222.6 g, with a mean weight of 22.8 g. The vast majority of the specimens are fragments of quartzite cobbles that clearly represent FCR. As already mentioned, the refitting of FCR pieces has documented that cobble tools were used along with unmodified cobbles as cooking and heating stones. The cobbles used in cooking and heating were procured from the same deposits as the other cobbles in the assemblage. Two cobble tools were partially reconstructed from fire-cracked fragments (Plate 26). These two specimens are not included in the cobble tool totals above. Other examples of refitted FCR are shown in Plate 27.

h) *Minerals*

The mineral assemblage includes 33 unmodified specimens: one tiny fragment of hematite or red ocher (0.1 g), one tiny fragment of mica (0.1 g), and 31 fragments of petrified or silicified wood, with a total weight of 64.0 g and a mean weight of 2.1 g. These materials are either natural inclusions in the site's sediments or were brought to the site by its inhabitants. The number of wood pieces may indicate that they were intentionally collected, probably from cobble deposits.

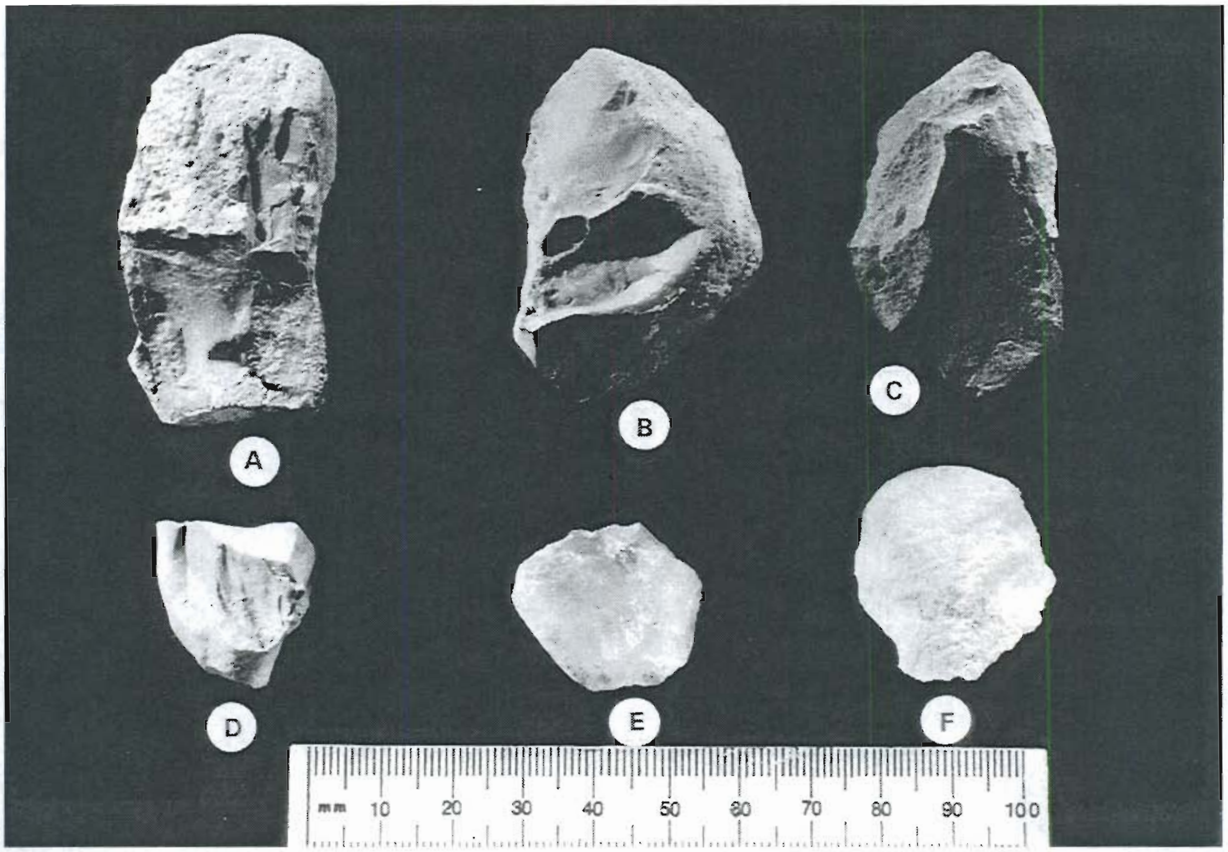


PLATE 22: Tested Cobbles and Freehand Cores. A: Tested Cobble, Jasper, Cat. No. 617 (Excavation Unit 27, Wall Collapse); B: Tested Cobble, Jasper, Cat. No. 693 (Excavation Unit 37, Stratum A, Level 1); C: Freehand Core, Possible Recycled Celt, Basalt, Cat. No. 82 (Test Unit 6, Stratum C, Level 8); D: Freehand Core, Chert, Cat. No. 544 (Excavation Unit 21, Stratum A, Level 1); E: Freehand Core, Quartz, Cat. No. 992 (Excavation Unit 52, Stratum B, Level 4); F: Freehand Core, Quartz, Cat. No. 976 (Excavation Unit 46, Stratum B, Level 8).

2. *Industries and Activities Through Time*

The lithic assemblage, in total, represents a limited range of activities, predominantly subsistence-related activities. Most of the bifaces and unifaces were used in hunting and associated processing tasks; most of the cobble tools were used in the processing of plant foods; the cores and debitage are wastage from tool production and maintenance; the FCR represents the remains of cooking and heating facilities; and the pottery sherds are fragments of Late Woodland containers used for cooking and storage (or transport). The absence or near absence of ornaments and additional tool types, such as drills, gravers, and axes or celts, supports the argument that the site was never more than a temporary campsite. Throughout much of prehistory, groups temporarily "set-up shop" at the site, probably because they were in the area for hunting and/or plant collecting (or possibly plant cultivation).

Even though there is evidence of mixing, there are basic similarities in tool and debris types between the Early, Middle, and Late AUs (Table 20). There are also some important differences: first, the absence of pottery in the Early AU supports the notion that this unit contains a limited number of intrusions from later components; second, there are greater numbers of cores, cobble tools, and FCR in the Early AU than in the Middle and Late AUs. This pattern is taken as evidence for more tool production, more plant processing, and more cooking and heating activities by the Early Archaic component. When this interpretation is coupled with the fact that there are more diagnostic points assigned to the Early Archaic component than any other component, it can be concluded that the site was used most intensively by Early Archaic groups.

In terms of lithic industries, the same basic types of tools were manufactured, used, and maintained over the course of the site's history: small to moderate-sized bifaces, formal and informal unifaces, and simple cobble tools. The only remarkable differences are in raw material selection, which have already been

TABLE 18: SUMMARY OF CORES

	CORE TYPE			
RAW MATERIAL	TESTED COBBLE	FREEHAND	BIPOLAR	TOTAL
JASPER				
Count	3	1	21	25
Total Weight	145.2	15.9	110.9	272.0
Mean Weight	48.4	15.9	5.3	10.9
QUARTZ				
Count	1	3	13	17
Total Weight	156.2	74.6	76.8	307.6
Mean Weight	156.2	24.9	5.9	18.1
CHERT				
Count	2	1	7	10
Total Weight	24.0	11.5	30.3	65.8
Mean Weight	12.0	11.5	4.3	6.6
QUARTZITE				
Count	1	.	.	1
Total Weight	79.3	.	.	79.3
Mean Weight	79.3	.	.	79.3
IGNEOUS/ METAMORPHIC				
Count	.	1	.	1
Total Weight	.	29.9	.	29.9
Mean Weight	.	29.9	.	29.9
TOTAL				
Count	7	6	41	54
Total Weight	404.7	131.9	218.0	754.6
Mean Weight	57.8	22.0	5.3	14.0

Note: all weights expressed in grams.

discussed, and the appearance of ceramic containers during the Late Woodland occupation.

3. *Site Patterning*

a) *Methodology*

This section examines the internal patterning of the site, focusing on the spatial distribution of lithic raw materials, artifact types, and features. Analysis of the site structure focuses not only on the identification and spatial delineation of activity areas, but also must address the closely related issue of site formation processes. Given the lengthy period of prehistory during which the site was repeatedly used, and its relatively shallow depth, there is no doubt that many different activities were carried out within the same relatively restricted space. Notwithstanding the preservation of features in subsoil contexts, the mixing of material related to different occupational periods and their associated activities has occurred, although there is evidence that the deposits are stratigraphically ordered. While some episodes of site use may have been quite restricted spatially, the total succession of occupational episodes has produced a complex of overlapping deposits.

Identification of activity areas within the site proceeds from the basic assumption that patterning in the archaeological record reflects patterns of cultural behavior. It is known that there are many processes that result in post-depositional displacement of artifacts from their discard location, distorting of the original patterns of discard that would have been visible when artifacts first entered the archaeological record as a result of loss, discard, or abandonment. During analysis of intrasite patterning, one must be aware not only of natural post-depositional distortions, but also of the various cultural behaviors associated with the disposal of refuse. Schiffer's (1972) classification of primary, secondary, and de facto refuse indicates that material may enter the archaeological record through a broad range of behaviors. In particular, it is important to realize that some items may enter the archaeological record at their location of use (e.g., by loss or abandonment), while other items may be discarded away from their location of use (e.g., by the deposition of refuse away from a habitation area). It cannot be assumed that use locations correspond to discard locations.

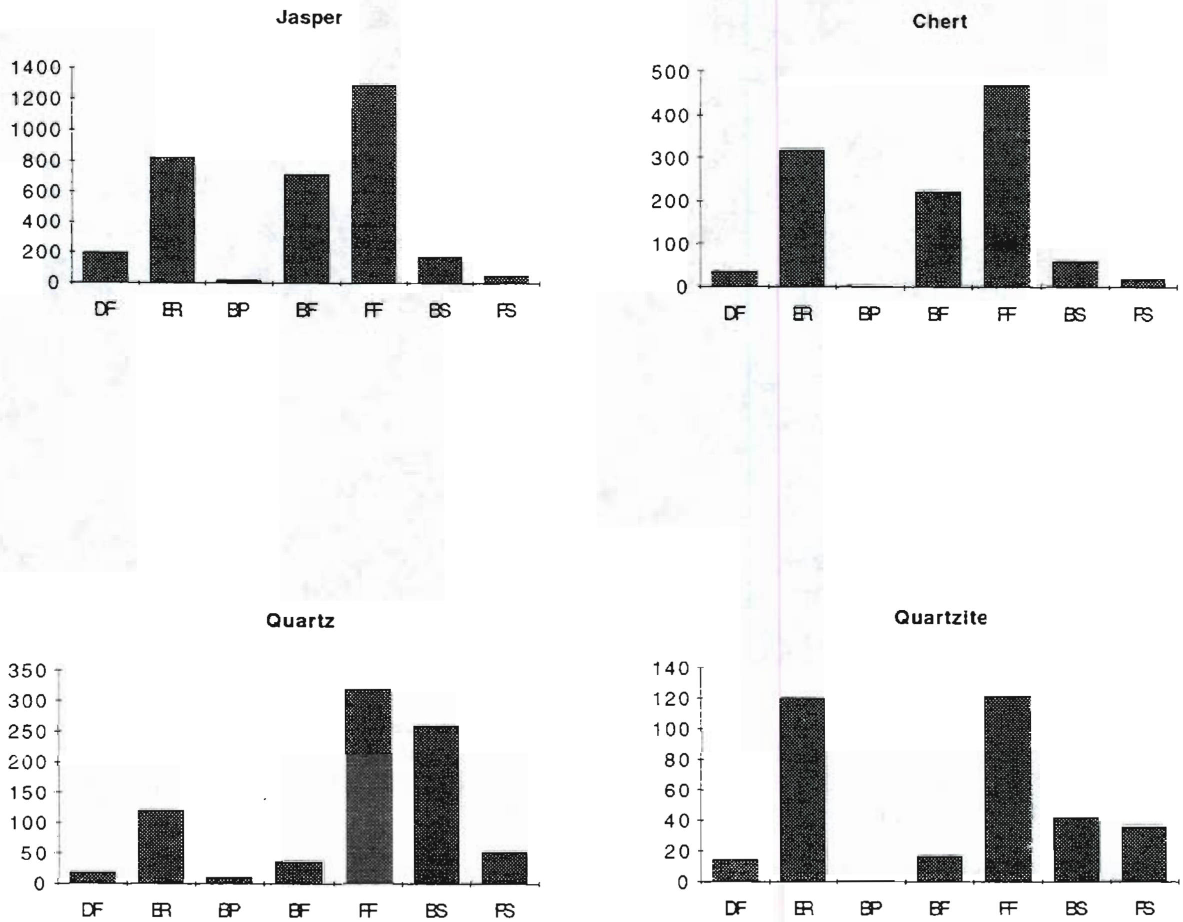
Archaeological features that represent architectural elements or facilities are generally assumed to represent primary or in situ refuse. At Site 7S-F-68, there is

Table 19: Summary of Debitage Types by Raw Material

Raw Material		Debitage Type								
		DF	ER	BP	BF	FF	BS	FS	IF	TOTAL
Jasper	Count	198	830	20	716	1,298	176	50	.	3,288
	Weight	231.4	311.0	6.7	139.2	354.8	316.7	9.2	.	1,369.0
Chert	Count	36	320	2	223	472	60	21	.	1,134
	Weight	48.6	147.5	1.6	48.8	116.6	161.1	3.3	.	509.4
Quartz	Count	19	121	11	37	321	260	53	.	822
	Weight	39.0	145.9	15.0	14.9	169.9	552.7	15.5	.	952.9
Quartzite	Count	15	120	1	17	122	42	36	.	353
	Weight	74.2	417.9	1.0	11.2	168.7	243.5	11.3	.	927.8
Argillite	Count	.	4	.	5	23	.	.	41	73
	Weight	.	29.2	.	22.0	43.8	.	.	76.2	171.2
Chalcedony	Count	2	16	2	10	15	2	1	.	48
	Weight	38.0	48.5	0.6	1.4	4.0	3.6	0.1	.	96.2
Rhyolite	Count	.	.	.	10	6	.	.	.	16
	Weight	.	.	.	5.4	0.6	.	.	.	6.0
Ironstone	Count	1	5	.	1	5	.	.	.	12
	Weight	2.5	4.4	.	0.2	3.5	.	.	.	10.6
Igneous/Metamorphic	Count	2	5	.	.	3	.	.	.	10
	Weight	30.8	14.7	.	.	3.9	.	.	.	49.4
Indeterminate	Count	1	20	.	5	47	1	10	.	84
	Weight	0.5	9.6	.	0.8	14.4	6.7	2.4	.	34.4
TOTAL	Count	274	1,441	36	1,024	2,312	541	171	41	5,840
	Weight	465.0	1,128.7	24.9	243.9	880.2	1,284.3	41.8	76.2	4,145.0

Debitage types: DF = decortication flake; ER = early reduction flake; BP = bipolar flake; BF = biface reduction flake; FF = flake fragment; BS = block shatter; FS = flake shatter; IF = indeterminate.

little or no direct evidence of the construction of permanent or semi-permanent shelters or habitation structures. Features identified at the site include a group of 11 informal cooking/heating areas represented by charcoal concentrations, three clusters of tools that represent either tool caches or activity areas, and one cooking/heating area represented by a scatter of FCR, charcoal, and discolored soil (see Chapter V). The single FCR feature (Feature 31) may represent a relatively formal cooking/heating area, while the others which lack significant amounts of FCR may represent less formal or casual foci for cooking, heating, or processing. Features such as the milling stone complex (Feature 22) and the cobble chopper and hoe (Feature 21) may represent relatively permanent activity areas within the site. While the site lacks direct architectural evidence of shelters or habitation structures, it is assumed that cooking and heating activities were the foci of domestic activity and that most daily cooking and heating tasks would have been carried out within the principal domestic space occupied by the household or social units that used the site (Binford 1978, 1983; O'Connell 1987; Yellen 1977). Based on these assumptions, the site features are used as points of reference for analysis of the patterning of lithic tools and debris within the site. Figure 6 (end pocket) shows the distribution of features within the site.



DEBITAGE TYPES

DF DECORTICATION FLAKE	ER EARLY REDUCTION FLAKE
BP BIPOLAR FLAKE	BF BIFACE REDUCTION FLAKE
FF FLAKE FRAGMENT	BS BLOCK SHATTER
FS FLAKE SHATTER	

FIGURE 16: Frequency of Debitage Types by Count for Jasper, Chert, Quartz, and Quartzite

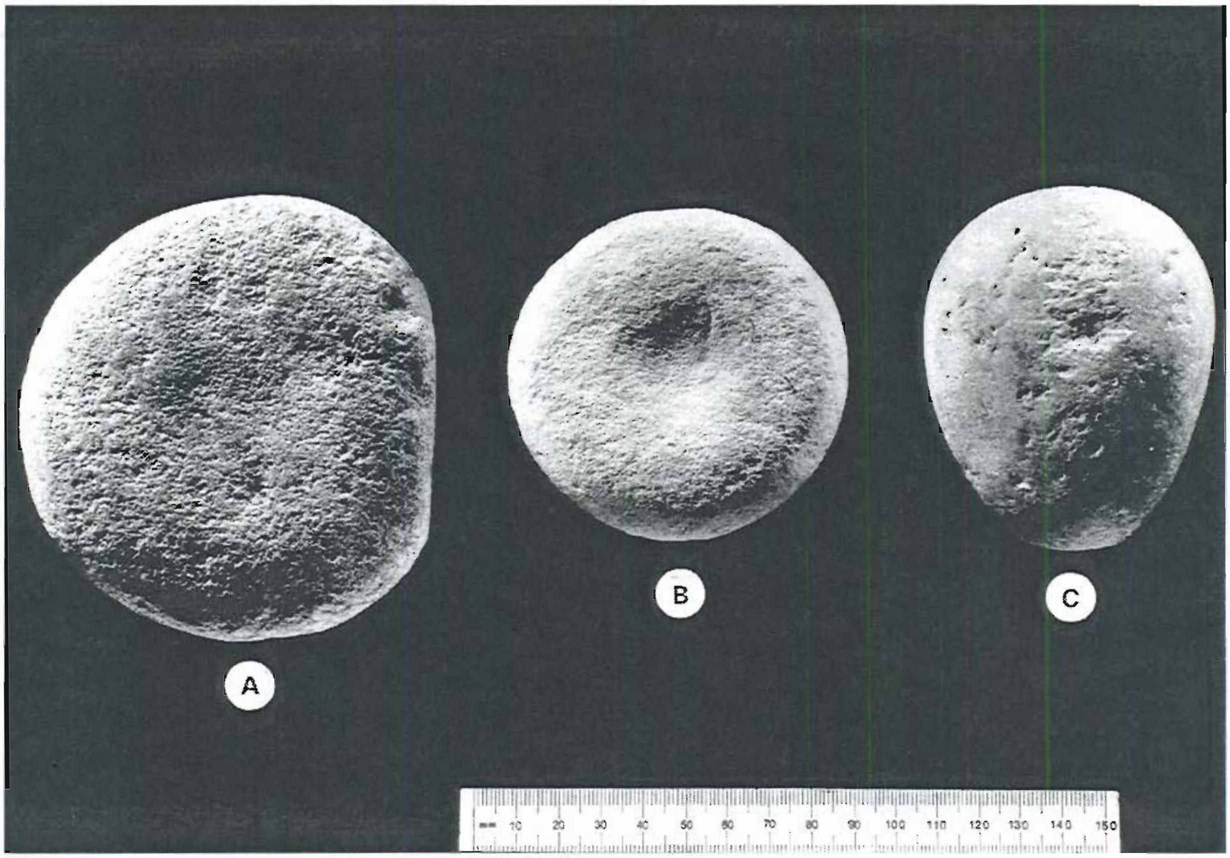


PLATE 23: Cobble Tools, Quartzite. A: Mano, Hammerstone Use, Cat. No. 785 (Excavation Unit 39, Stratum B, Level 4); B: Pitted Cobble, Hammer and Mano Use, Quartzite, Cat. No. 370 (Excavation Unit 35, Stratum B, Level 4); C: Hammerstone, Anvil Use, Quartzite, Cat. No. 1217 (Excavation Unit 57, Stratum B, Level 4).

It is apparent that depositional planes or occupational surfaces have been obscured to a degree that limits analysis of the deposits according to strict vertical provenience. Nonetheless, initial analysis determined that the principal periods of site occupation were represented to a degree within three broad analytical units (AUs) defined according to vertical provenience (see Chapter VI). While these analytical units would presumably include occupational surfaces associated with the site's various occupational episodes, there has also been some mixing of deposits, so that spatial analysis cannot be strictly limited to the analytical units. Given this situation, it is most appropriate to examine the site's internal structure by extending the scope beyond the AUs to include selected elements of the artifact assemblage such as diagnostic projectile points, tools, and raw materials. While there was only limited evidence of vertical stratigraphy, clusters and concentrations of specific artifact types and raw materials were in many cases readily apparent, indicating the presence of horizontally well-defined activity areas, which may be roughly correlated with specific AUs.

The methodology used to examine the site's internal structure involved a combination of computer-assisted statistical techniques and visual examination of manually plotted distribution maps. The lithic artifact classes were used as the principal analytical categories for examination of intrasite patterning. Concentrations of various raw materials were identified from visual examination of density distribution maps for each raw material, which were in turn based on computer summaries indicating the amounts of debitage according to provenience. Definition of specific concentrations was based on the computed mean and standard deviation values for each unit or subsoil quadrant. Initially, some concentrations were plotted by excavation units, followed by plotting of the plowzone and the subsoil quadrants. The plowzone, which corresponds to the Late AU, was plotted by excavation unit, while subsoil concentrations were plotted according to 1x1-meter quadrants within units. In general, the density distributions were highly skewed, and in many cases the mean and standard deviation values were quite close. In most cases, six density ranks were defined, based on the computed mean and

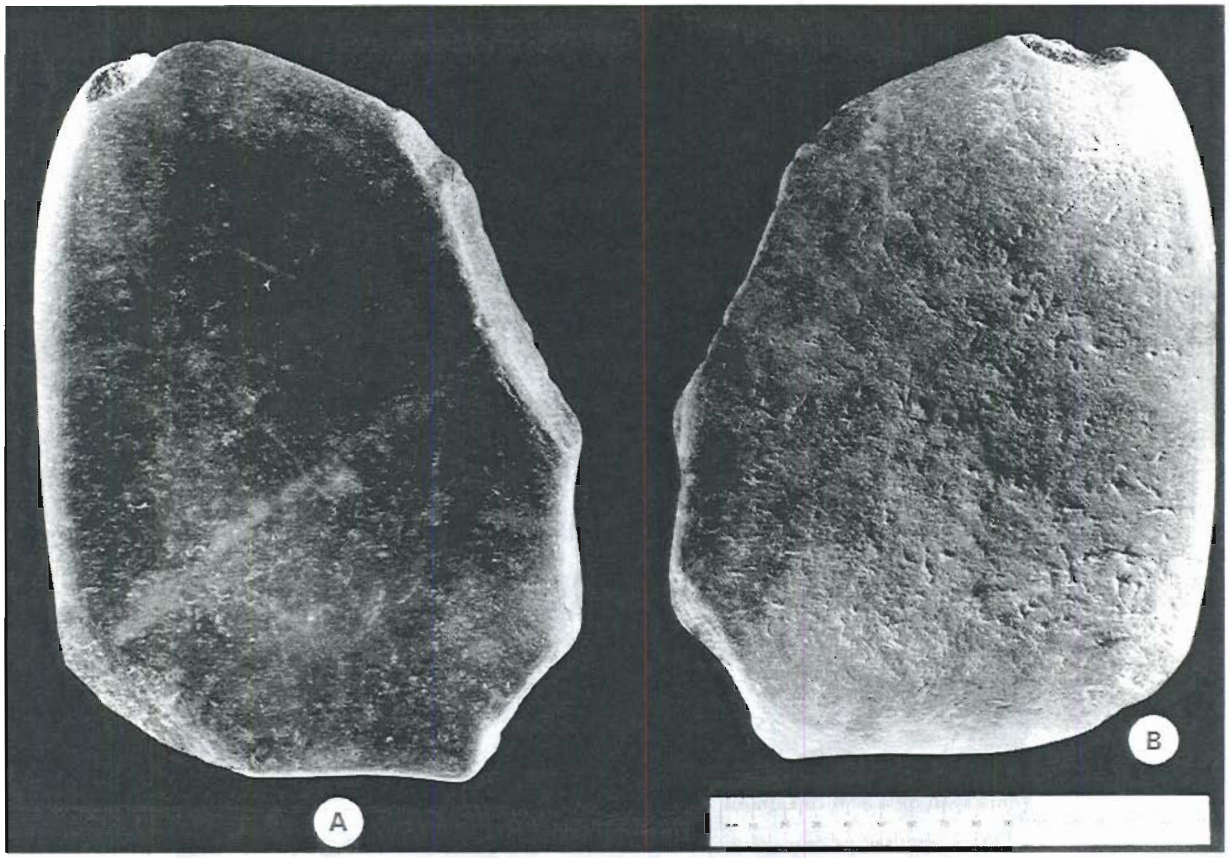


PLATE 24: Metate, Anvil Use, Basalt, Cat. No. 508 (Excavation Unit 42, Feature 22). A: Obverse; B: Reverse.

standard deviation values for each material, with the following cut-off points:

zero
mean - 1/2 standard deviation
mean
mean + 1 standard deviation
mean + 2 standard deviations

Some materials with low overall frequencies could not be plotted with this degree of discrimination. In the following discussion, the terms *low*, *moderate*, and *high* apply to successive gradations along the scale described above; and the term "concentration" is applied to densities greater than the mean plus two standard deviations or to a group of adjacent plotting units with densities more than one standard deviation above the mean. The distribution and clustering of tools were identified by visual inspection of manually plotted distribution maps.

b) *Results*

This section describes the spatial distribution of tools, debitage, and lithic raw materials associated with the various occupational components. The discussion is organized according to chronological units, beginning with the earliest occupation of the site, represented by the Paleoindian and Early Archaic occupations.

A possible Paleoindian component is represented by the recovery of a crystal quartz fluted-point production failure, a crystal quartz point tip, and a possible late Paleoindian lanceolate point made from jasper. Because no other diagnostic artifacts in the assemblage are made from crystal quartz, and because crystal quartz fluted points have been reported from other sites in the surrounding region (Ebright 1992; Peck 1985), it is believed that the entire assemblage of crystal quartz tools and debitage is associated with the fluted-point component at Site 7S-F-68. Crystal quartz debitage is concentrated in the cluster formed by Units 35 and 48 on the western margin of the site, with a few additional pieces recovered from the western part of the North Excavation Block (Figure 17). The fluted-point production failure is also located in Unit 35, while the remaining crystal quartz tool, a biface-reduction flake used as a cutting tool, was recovered from Level 5 of Unit 51 (Figure 18). Of the assignable crystal quartz items, 78 percent were associated with the Early AU, including both tools; the

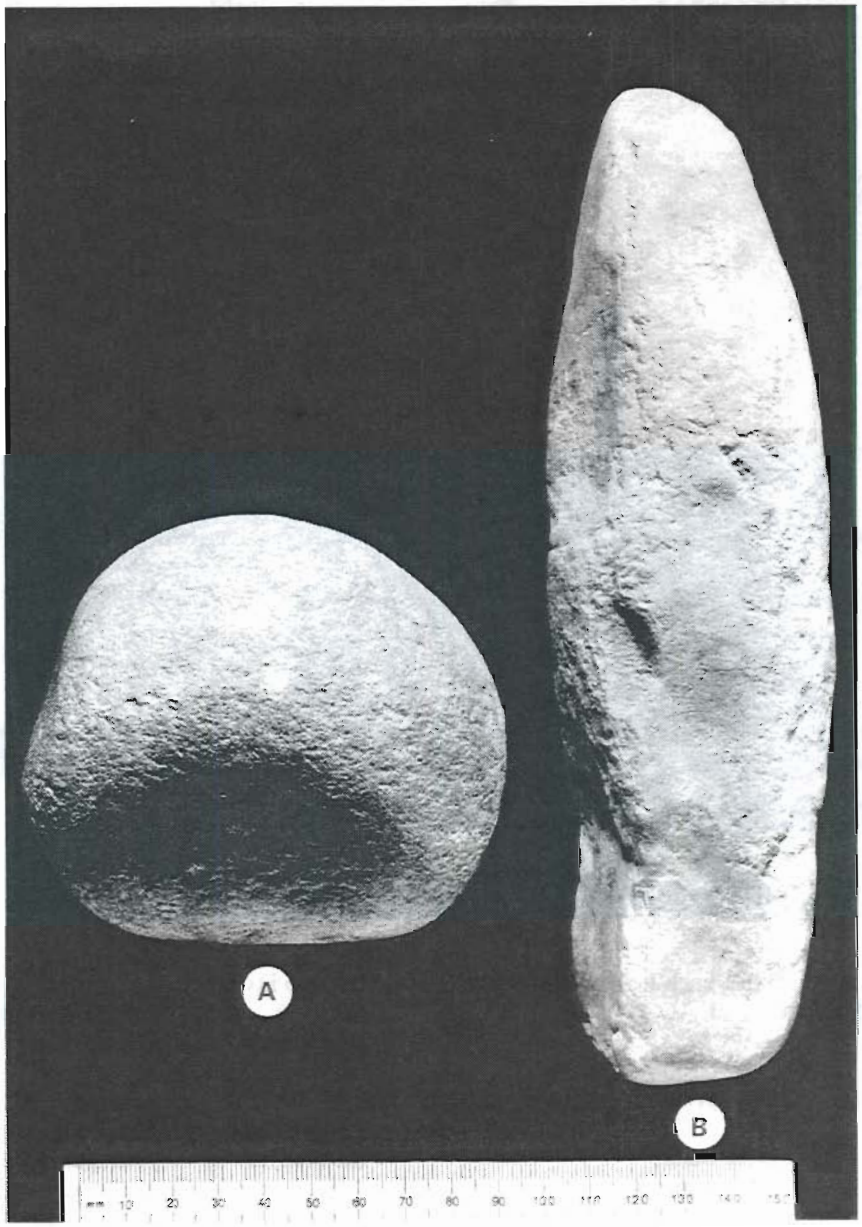


PLATE 25: Cobble Tools. A: Hammerstone, Anvil and Mano Use, Quartzite, Cat. No. 508 (Excavation Unit 42, Feature 22); B: Pitted Cobble, Pestle and Pick, Siltstone, Cat. No. 116 (Test Unit 11, Stratum B, Level 3).

remaining debitage was associated with the Middle AU.

Feature 21, an activity area represented by a cobble chopper and hoe, has been included in the Early AU, and it is within the concentration of crystal quartz identified in Units 35 and 48. This feature is probably associated with the Early Archaic occupation of the site. These tools are not typically associated with Paleoindian tool kits; however, they are often associated with Early Archaic complexes (e.g., Broyles 1971).

Nineteen Early Archaic points were identified in the collection: 1 Palmer, 1 Kirk corner notched, 1 Decatur, 7 Kirk stemmed, 6 bifurcates, and 3 indeterminate fragments. These points are widely distributed over the site, but are most concentrated in the South Excavation Block (Figure 19), where they cluster near Feature 22 (the mano/metate cluster) and Feature 25

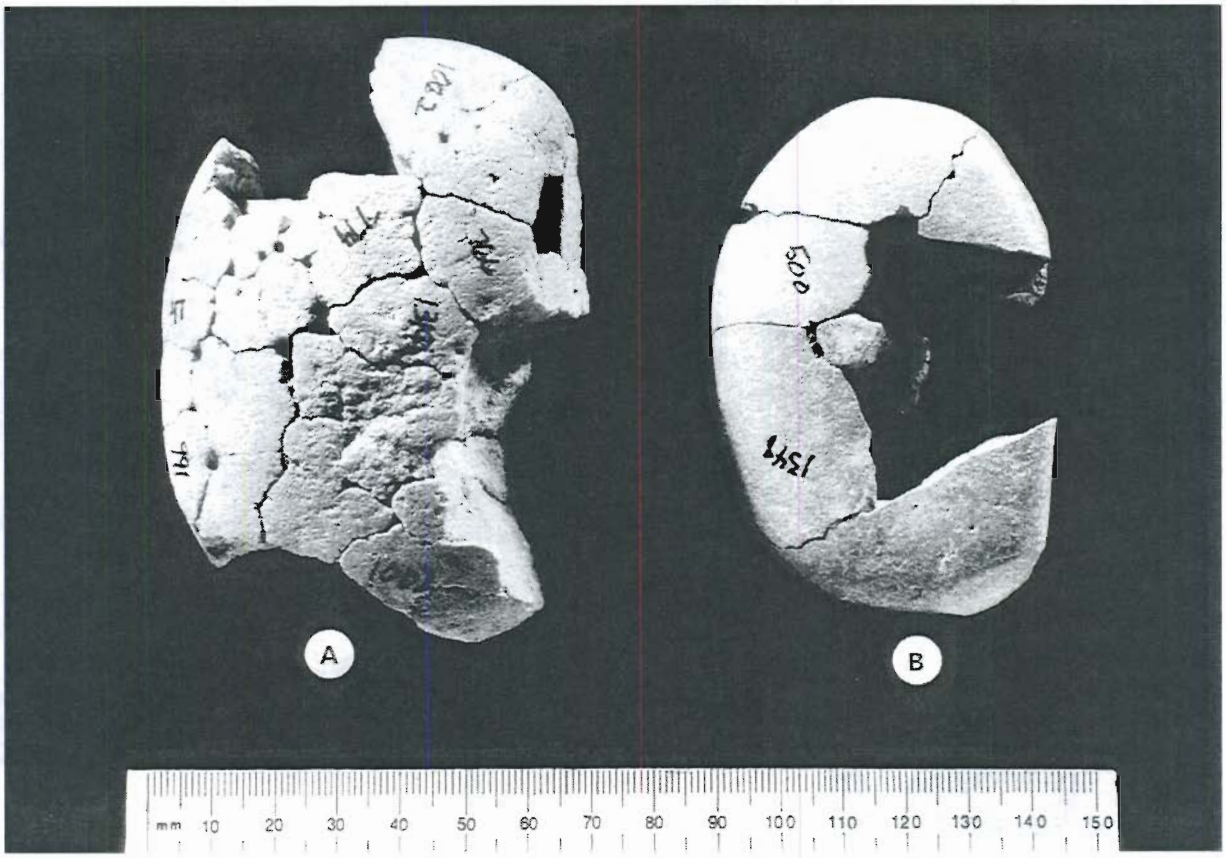


PLATE 26: Refitted Cobble Tools, Quartzite. A: Hammer and Anvil Use, Refit No. FCR-1; B: Hammer Use, Refit No. FCR-3.

(a possible cooking/heating area represented by a small concentration of charcoal). It is also notable that Unit 45 contained the highest number (*N*=4) of Early Archaic points and that the earliest radiocarbon date (7560 $\pm$ 340 years BP; sample # Beta-56049) came from Level 10 of this unit.

Early Archaic lithic procurement patterns show a strong preference for cryptocrystalline materials, as 15 of the 19 points in this group were made from jasper (*N*=8), chert (*N*=6), and chalcedony (*N*=1). Quartz and quartzite are also represented by two examples each. Among these raw materials, quartzite appears to be associated exclusively with the Early Archaic component, as it was used only for production of Kirk Stemmed points, and it was concentrated relatively low in the profile, as measured by raw material frequencies in the excavation levels (see Figure 9). Attribution of quartzite to the Early Archaic component is supported by the fact that the Early AU contained 67 percent of the quartzite by count and 78 percent by weight. The distribution of quartzite debitage in subsoil contexts (Early and Middle AUs) shows a broad distribution across the site, but with a large, distinct concentration in the South Excavation Block. In the Early AU contexts, the concentration of quartzite includes Units 1, 39, 51, and 52, and it is apparently centered on Feature 31, a heating/cooking area represented by a cluster of FCR. High frequencies of quartzite in Early AU contexts were also present in Unit 36, which is adjacent to Feature 31, and in Unit 45, which included the concentration of Early Archaic points. Figure 20 illustrates the distribution of chipped-stone quartzite in the Early AU contexts.

Vein quartz was also used exclusively for Early Archaic points, and this material has the second lowest overall vertical distribution at the site, as measured by artifact counts in the excavation levels. Its spatial distribution in the subsoil levels (Early and Middle AUs) shows three concentrations that closely match the patterns for crystal quartz and quartzite (Figure 21). The highest densities for vein quartz were recovered from the cluster of Units 35 and 48, which also contained the crystal quartz concentration associated with the possible fluted point occupation. Two concentrations of vein quartz were also recovered in the South Excavation Block. The largest of these was in Units 51 and 52, overlapping the quartz concentration focused on Feature 31; a second, smaller concentration of vein quartz was in Units 45 and 46, which is within the largest concentration of Early

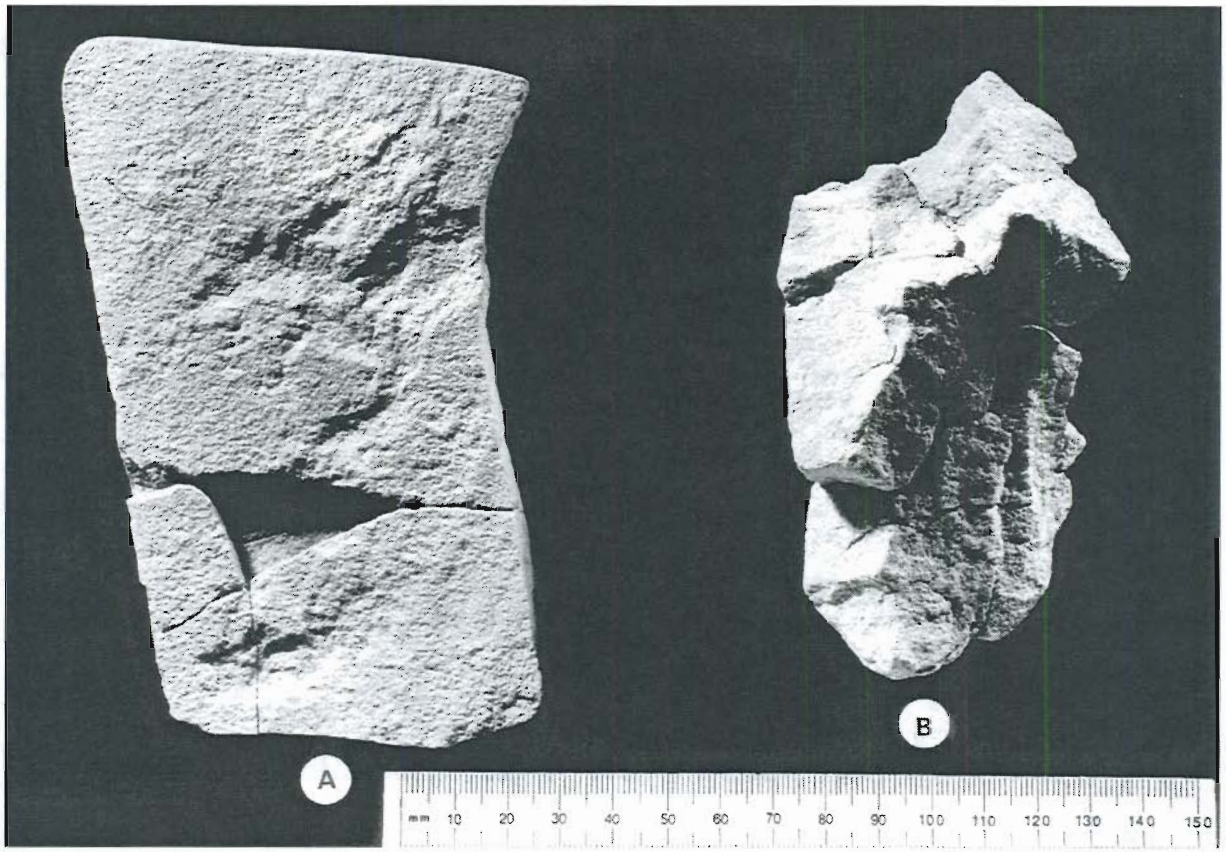


PLATE 27: Refitted Cobbles. A: Quartzite, Refit No. FCR-7; B: Sandstone, Refit No. FCR-14.

Archaic points. One of the Early Archaic quartz points was recovered from an Early AU context in Unit 7, where it appears to be related to the vein quartz concentrations; the other was recovered from an historic dog burial (Feature 1), and therefore its cultural context is uncertain. In addition, the vein quartz tools in the areas of concentration include various bifaces (early-stage, middle-stage, late-stage, and indeterminate), unifacial tools (a retouched flake and a sidescraper), cores, and a hammerstone. The vein quartz tools, like the debitage, are concentrated in the same areas of the site as the vein quartz debitage and the other Early Archaic components (Figure 22). Vein quartz cores are distributed more widely across the site: for example, in the North Excavation Block and the cluster of Units 33, 49, and 57 west of the South Excavation Block. A vein quartz sidescraper recovered from an Early AU context in the North Excavation Block may represent a secondary Early Archaic activity area.

Chalcedony, like crystal quartz, vein quartz, and quartzite, apparently was used only during the Early Archaic, as the one diagnostic point in the assemblage made from this material is a Kirk Stemmed point. Chalcedony accounts for a small fraction of the site's chipped-stone assemblage (2.2%), and the distribution of this material is correspondingly sparse across the site. When analysis is focused on the levels of recovery from excavation units, regardless of analytical units, two concentrations may be identified--one in Unit 14 and the other in Unit 35. Chalcedony was recovered primarily from subsoil contexts (i.e., the Early and Middle AUs), and the spatial distribution of tools and debitage (Figure 23 shows that this material is widely scattered over the northern area of the site. The concentration in Unit 35 overlaps the other early Paleoindian/Early Archaic components represented by crystal quartz and vein quartz, and all of the chalcedony in these units is associated with Early AU contexts. Chalcedony is also broadly distributed across the northwestern sector of the North Excavation Block, with the highest frequencies recovered from Unit 14. In the North Excavation Block, chalcedony was recovered primarily from contexts assigned to the Middle AU. A distinctive procurement pattern for chalcedony is evident in the ratio of block cortex to cobble cortex, as discussed above in Section D. Tools made from chalcedony include two projectile points and two utilized flakes. The one chalcedony point that could be typed (a Kirk Stemmed point) forms part of the cluster of Early Archaic points in Units 45 and 46.

TABLE 20: FREQUENCY OF PREHISTORIC ARTIFACT CLASSES BY ANALYTICAL UNITS

ANALYTICAL UNITS/ARTIFACT CLASS	COUNT	WEIGHT
EARLY AU		
Bifaces	42	2,442.7
Cores	26	438.3
Cobble Tools	11	7,488.9
Debitage	2,349	2,175.3
Cracked Rock	171	3,485.3
Groundstone Tools	0	0
Minerals	31	64.0
Prehistoric Pottery	0	0
Unifaces	21	128.8
SUBTOTAL	2,651	16,223.3
MIDDLE AU		
Bifaces	51	296.2
Cores	12	151.9
Cobble Tools	6	1,542.4
Debitage	2,397	1,210.9
Cracked Rock	72	1,789.2
Groundstone Tools	0	0
Minerals	2	0.2
Prehistoric Pottery	14	17.1
Unifaces	24	107.7
SUBTOTAL	2,578	5,115.6
LATE AU		
Bifaces	19	35.4
Cores	10	98.4
Cobble Tools	0	0
Debitage	807	564.8
Cracked Rock	27	911.5
Groundstone Tools	1	0.7
Minerals	0	0
Prehistoric Pottery	92	153.1
Unifaces	15	77.6
SUBTOTAL	971	1,841.5
GRAND TOTAL	6,200	23,180.4

Note: all weights expressed in grams.

Chert and jasper account for the majority of the Early Archaic points, but the use of these materials is not limited altogether to the Early Archaic. Six of the seven chert points that could be typed were Early Archaic, while the seventh is among the group of 12 Late Archaic/Early Woodland stemmed points. This suggests that chert was one of the most favored raw materials during the Early Archaic, but that its use continued through the Late Archaic/Early Woodland. As one of the most common materials in the assemblage, chert is broadly distributed over the site. The largest concentration of chert occurs in the Early AU contexts, and this concentration spreads across Units 42, 45, and 51 in the South Excavation Block (Figure 24). The spatial concentration of chert in the Early AU is similar to that of quartzite and vein quartz, in that they exhibit the highest frequencies in the western portion of the South Excavation Block, apparently focusing on Features 22, 25, 28, and 31. Chert tools in the Early AU contexts include eight projectile points, two middle-stage bifaces, three indeterminate bifaces, one endscraper, one retouched flake, three utilized flakes, and one bipolar core (Figure 25). Most of these were from contexts associated with the concentration in the South Excavation Block, although a few were from other contexts. What is perhaps most noteworthy about the distribution is that the unifacial tools were mostly recovered from outlying contexts, including three in Unit 23 and one in Unit 49. The majority of the projectile points were from contexts associated with the concentration centered on Feature 31.

Jasper, the most common material in the site assemblage, was apparently the preferred lithic raw material during the Early Archaic, but it was also used during the subsequent Late Archaic/Early Woodland and Late Woodland occupational episodes. The one possible Middle Archaic point was made of jasper, and this example was recovered from an Early AU context. As the most common material in the site assemblage, jasper exhibits a wide distribution throughout the site

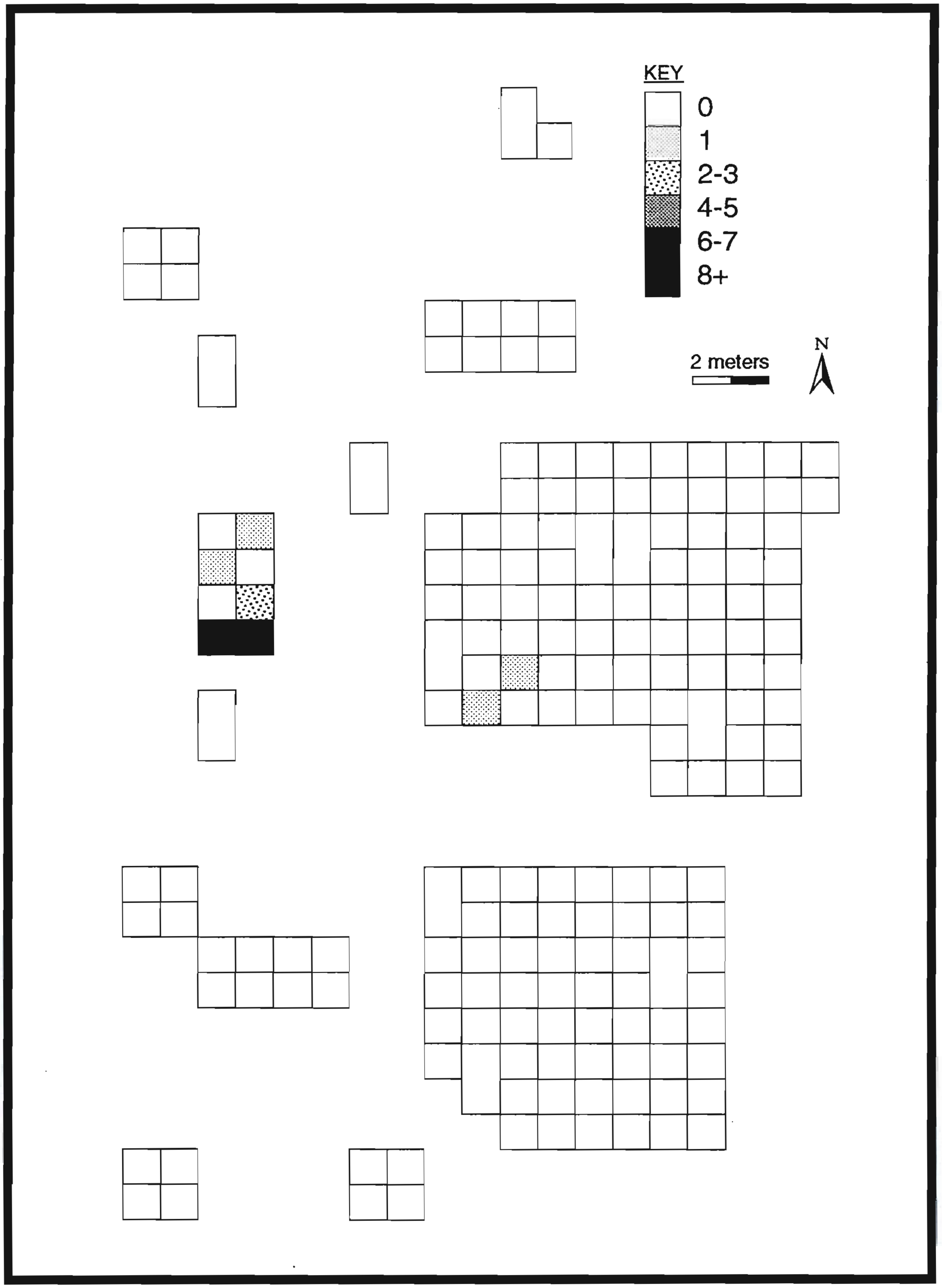


FIGURE 17: Distribution of Crystal Quartz Debitage

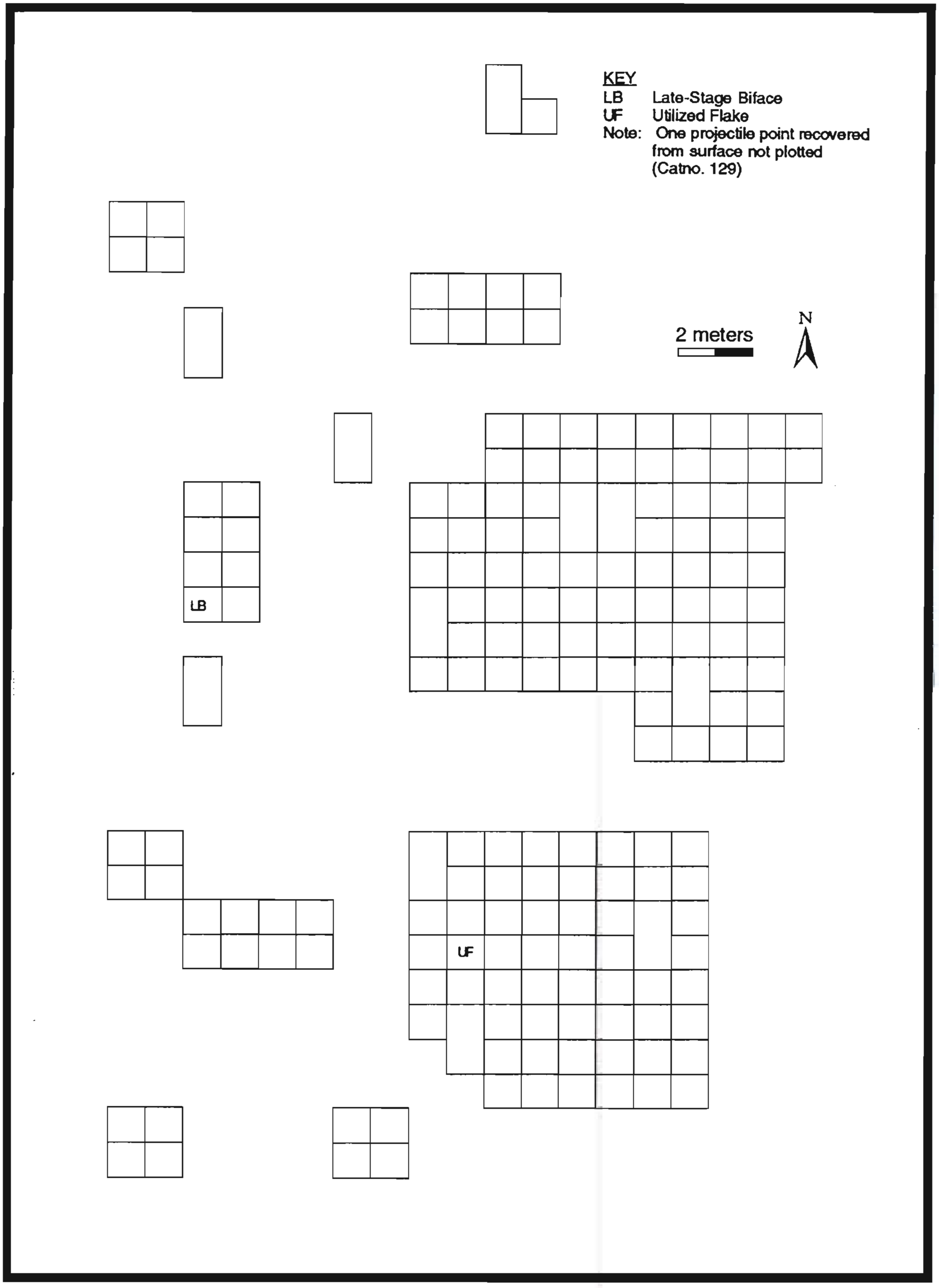


FIGURE 18: Distribution of Crystal Quartz Tools

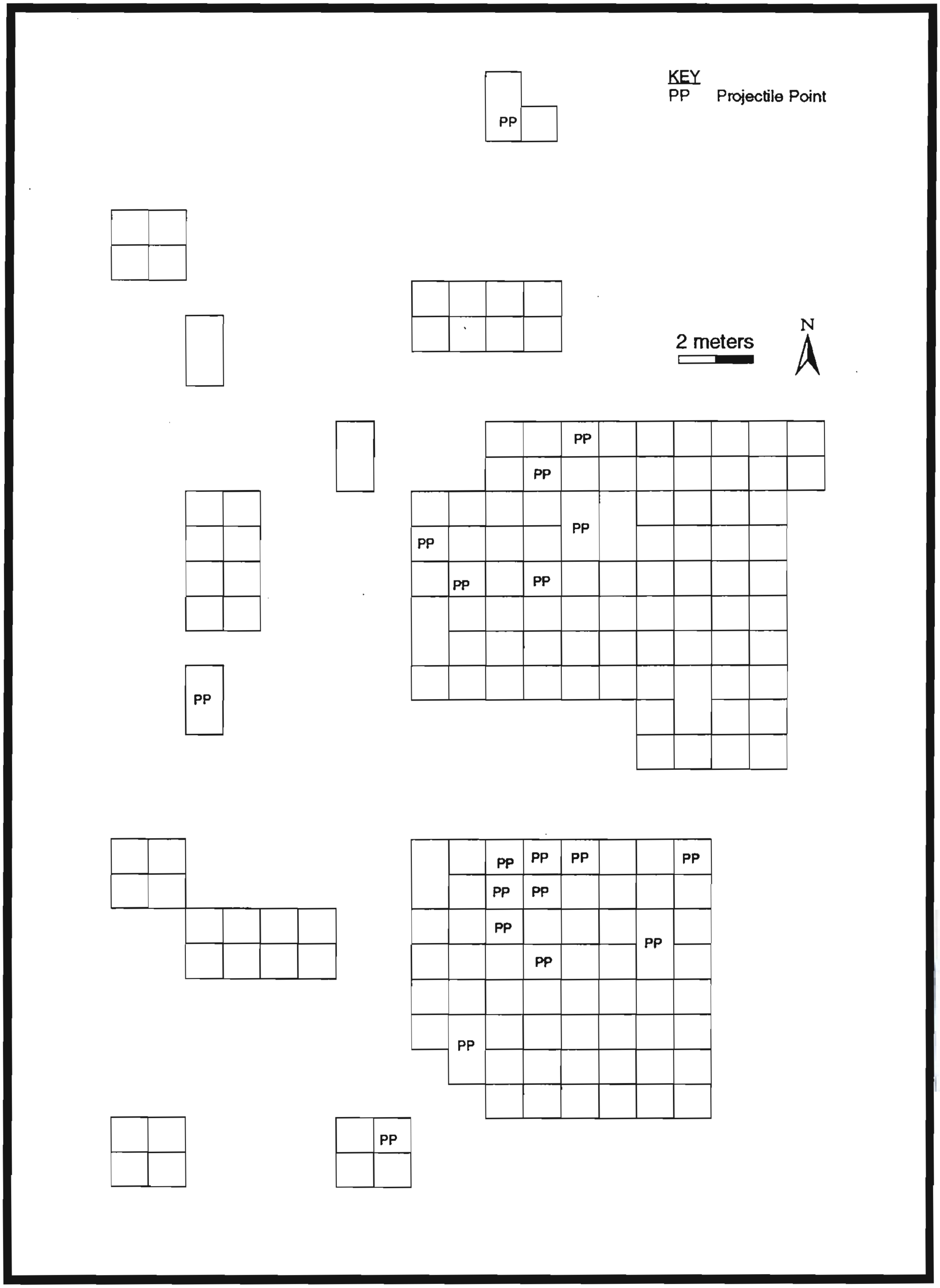


FIGURE 19: Distribution of Early Archaic Points

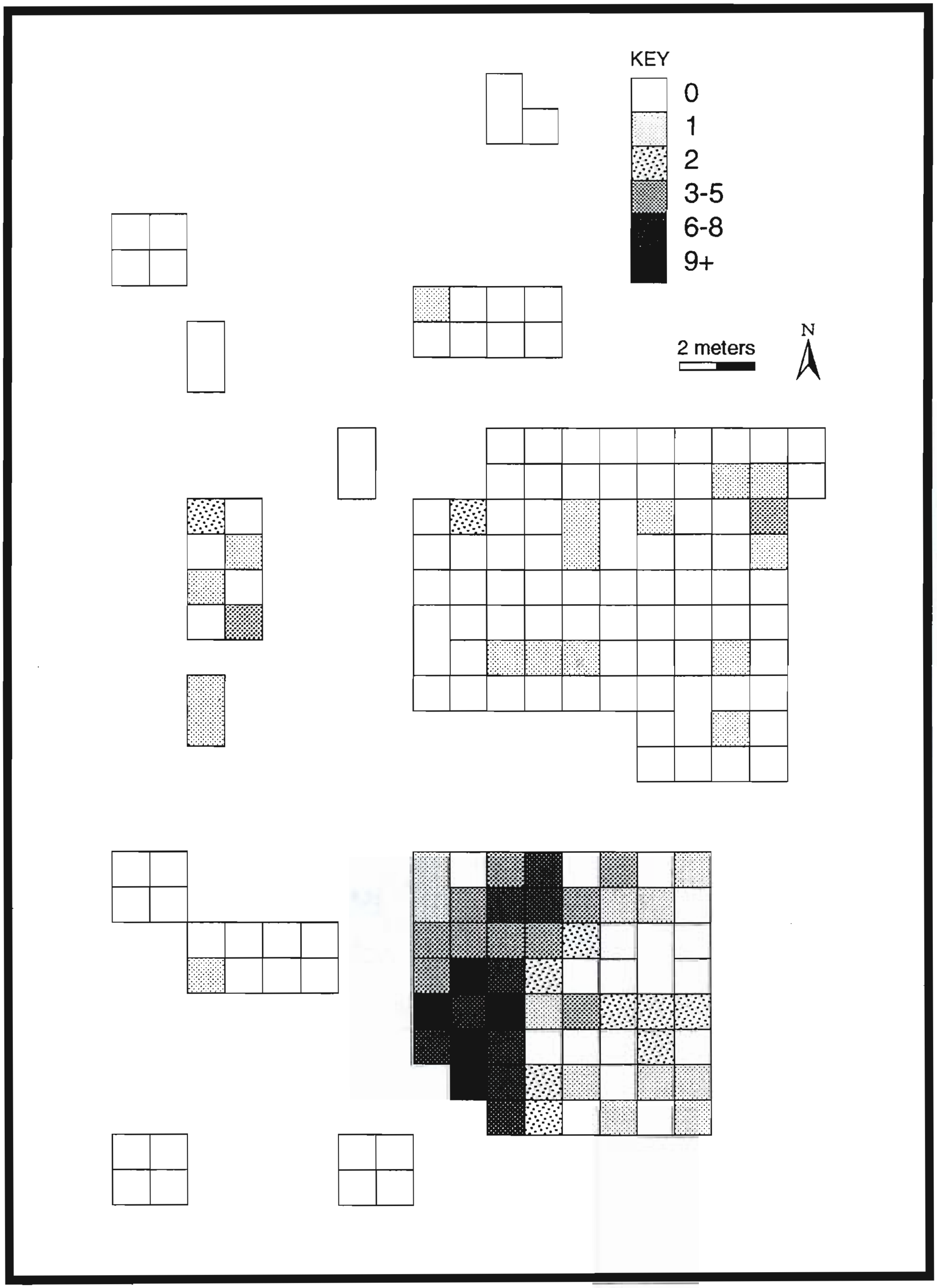


FIGURE 20: Distribution of Quartzite Debitage in Early AU Contexts

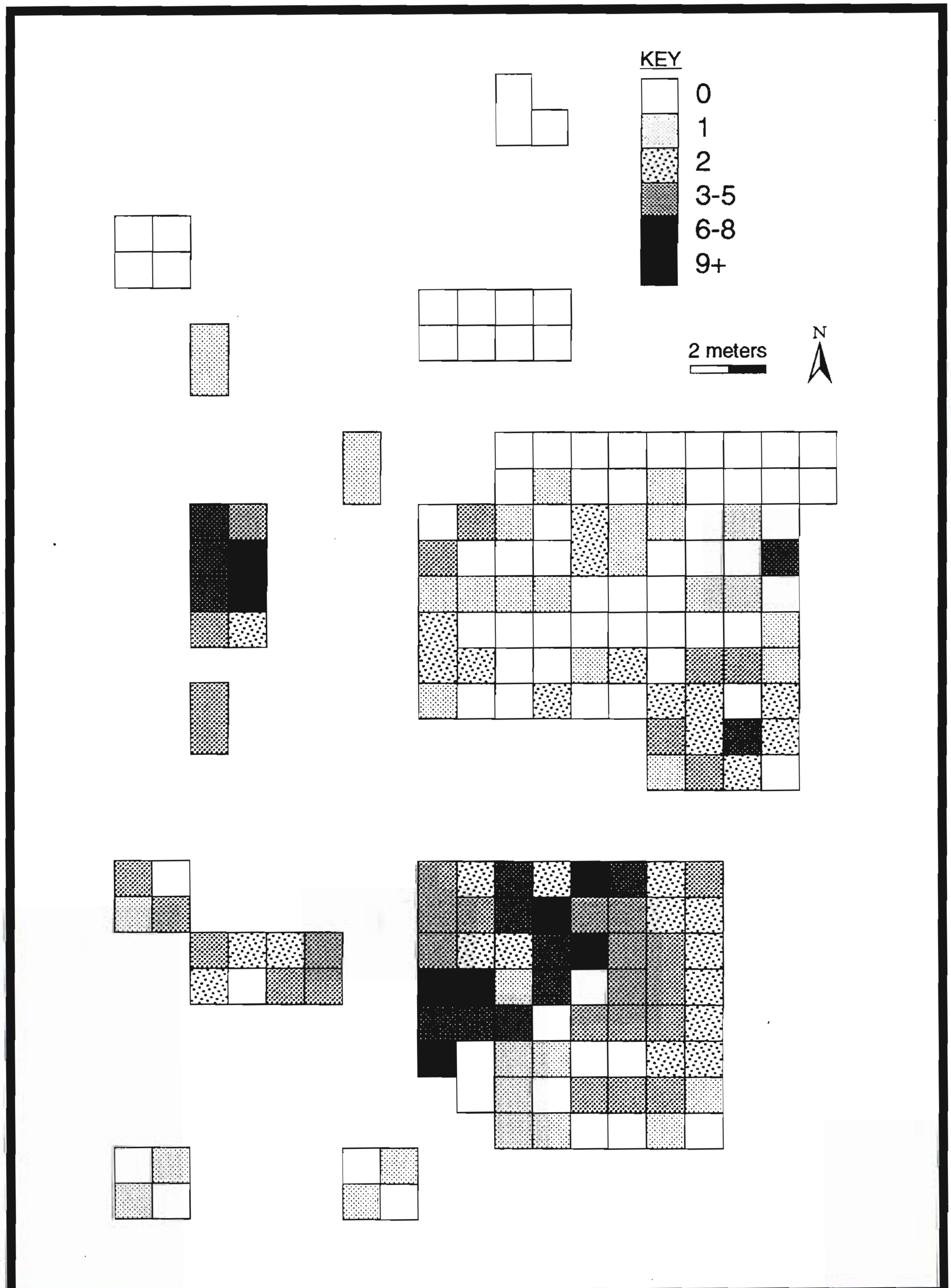


FIGURE 21: Distribution of Vein Quartz Debitage in Early AU Contexts

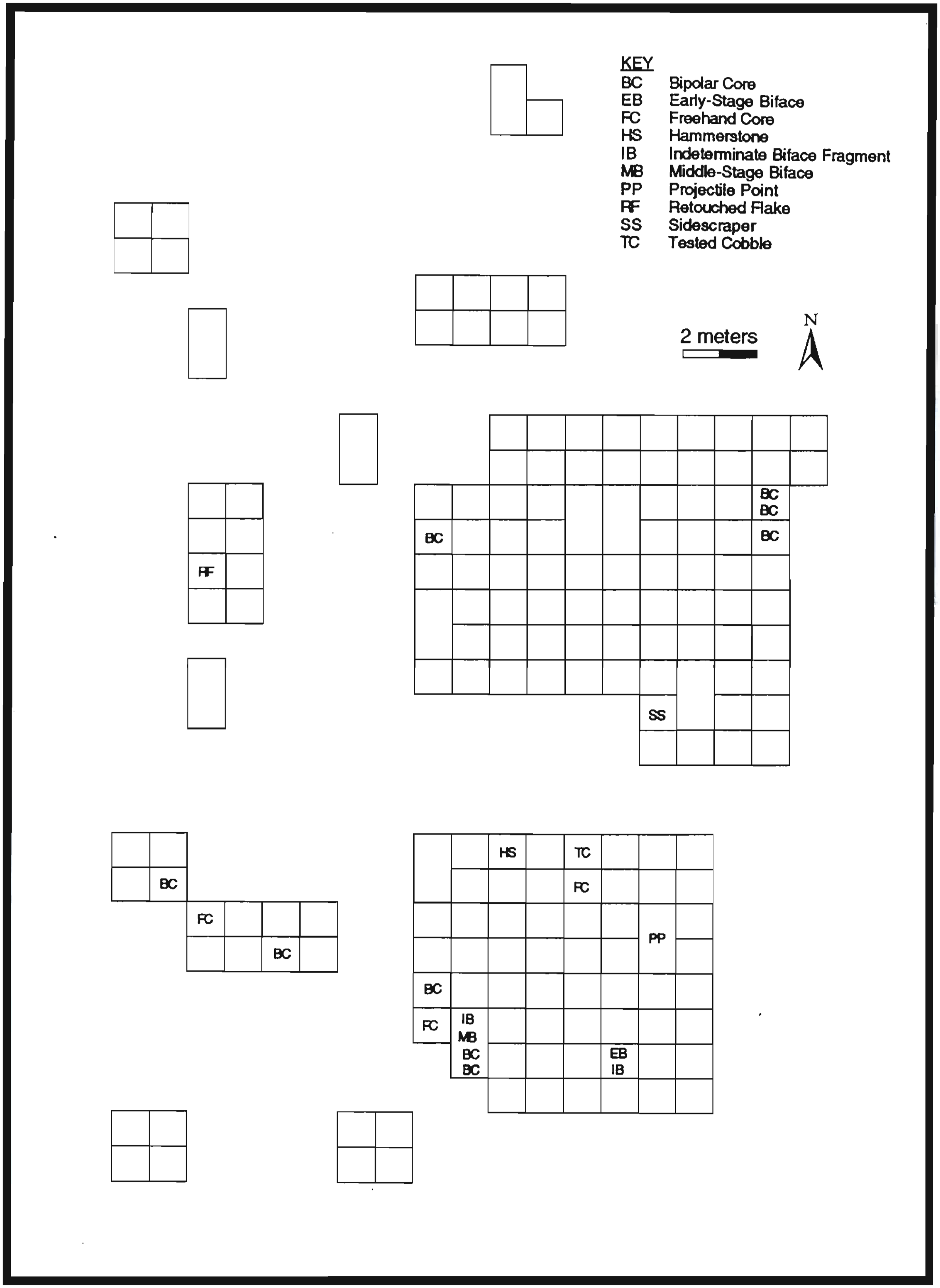


FIGURE 22: Distribution of Vein Quartz Tools in Early AU Contexts

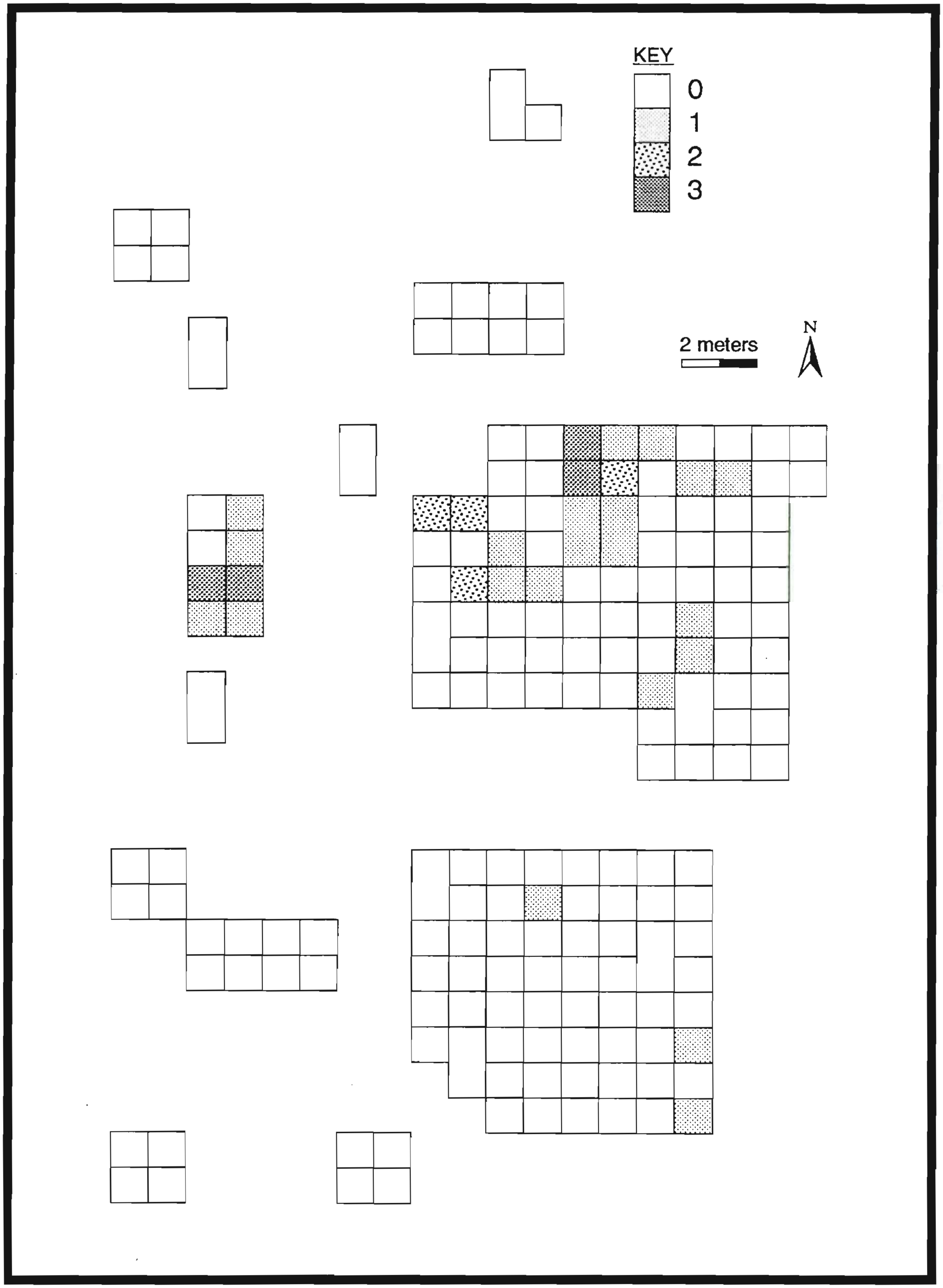


FIGURE 23: Distribution of Chalcedony in Subsoil (Early and Middle AU) Contexts

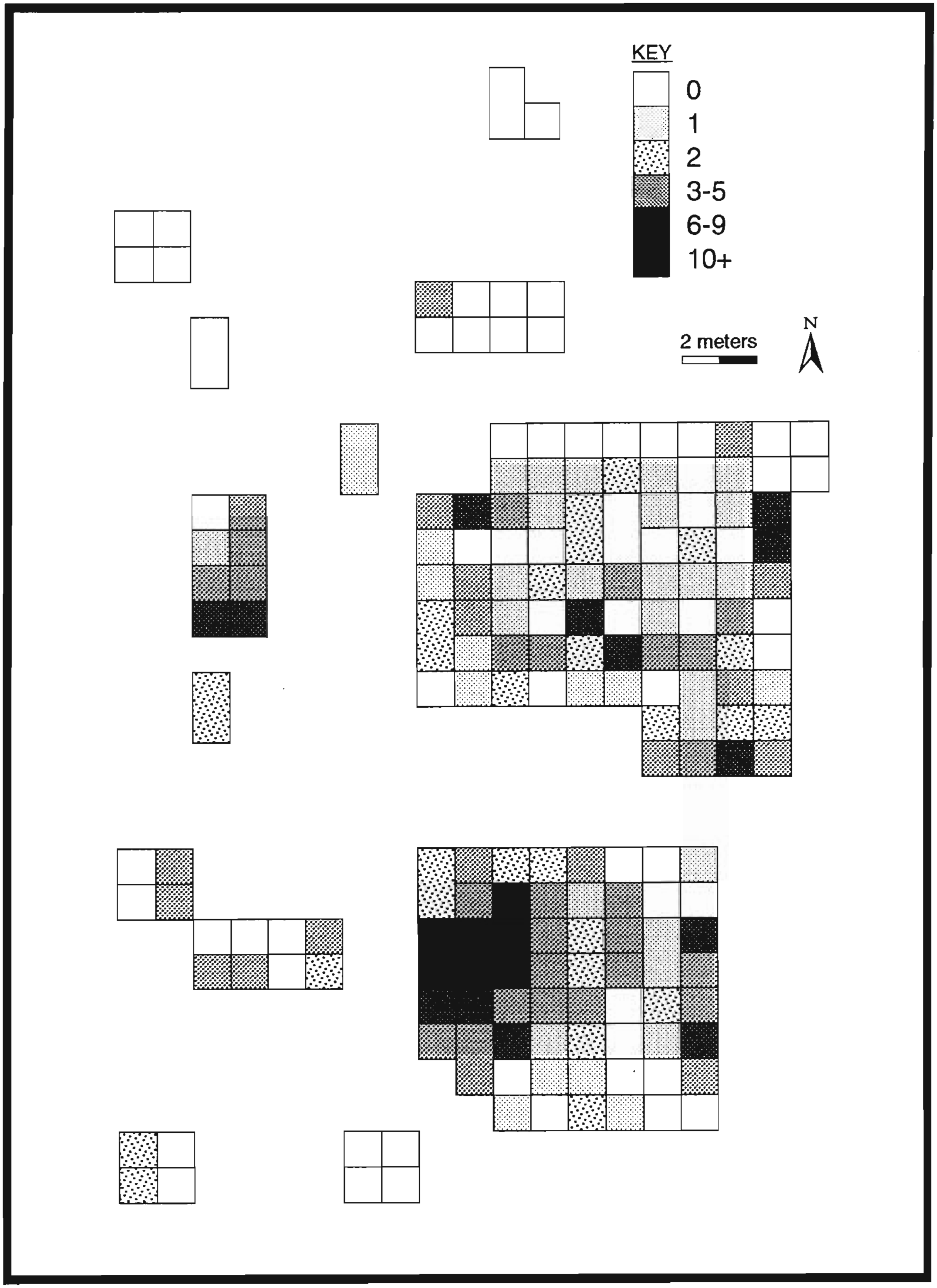


FIGURE 24: Distribution of Chert in Early AU Contexts

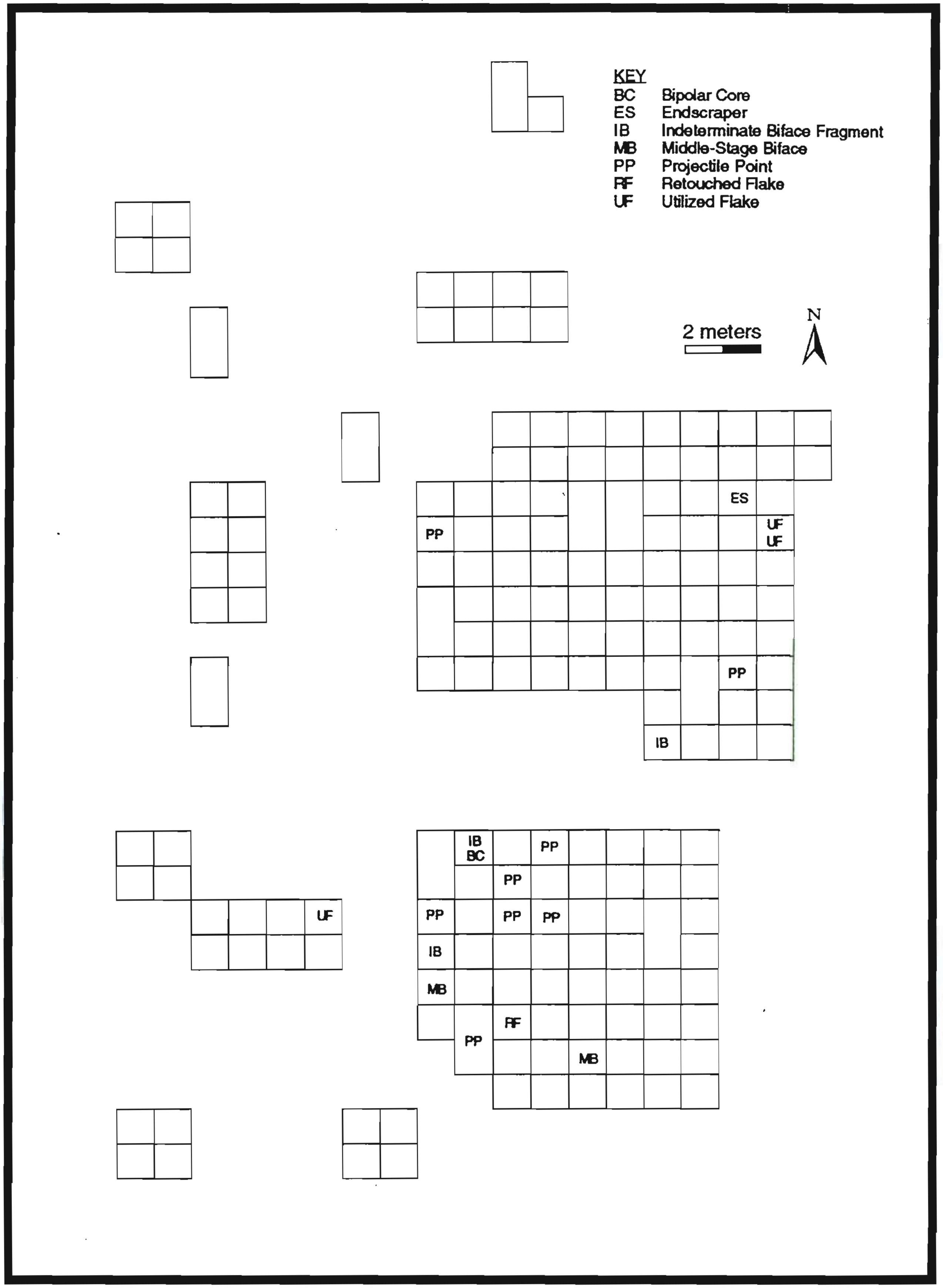


FIGURE 25: Distribution of Chert Tools in Early AU Contexts

(Figure 26). In the Early AU contexts, there are three concentrations of jasper. The largest of these occurred in Units 42, 45, 51, and 54, overlapping the concentrations of vein quartz, quartzite, and chert. The second largest concentration was in Unit 23 of the North Excavation Block, an area which had been severely disturbed by downcutting and historical interments. The smallest discernible concentration of jasper occurred adjacent to Feature 33, a small lithic workshop area located along the eastern margin of the South Excavation Block (Unit 41), which was represented by a large, early-stage argillite biface and four argillite flakes. Jasper tools in the Early AU include 10 projectile points, 1 early-stage biface, 1 middle-stage biface, 1 late-stage biface, 4 indeterminate bifaces, 2 endscrapers, 2 sidescrapers, 3 retouched flakes, 2 utilized flakes, and various cores (6 bipolar, 1 freehand, and 1 tested cobble). The spatial distribution of jasper tools in the Early AU contexts shows a rather broad distribution, with the majority of the tools in the South Excavation Block (Figure 27). However, the majority of the jasper unifacial tools are in outlying contexts, a pattern similar to that of the chert tools. Many of the jasper points in the South Block apparently are related to the concentration focused on Feature 31.

Most of the raw material concentrations associated with the Early AU contexts are located in the South Excavation Block, where they appear to be associated with Feature 31, the cooking/heating area, and with Feature 22, the milling area that includes the mano and metate. Other cobble tools associated with this area include two quartzite cobbles with mano wear (Unit 39), a quartzite pestle (Unit 45), a quartzite hammerstone (Unit 42), and a quartz hammerstone (Unit 45), as illustrated in Figure 28. The widespread distribution of unifacial tools in the Early AU contexts, noted above for chert and jasper, is illustrated in Figure 29.

Contexts assigned to the Middle AU are presumably most representative of the site's Late Archaic/Early Woodland occupations. The culturally diagnostic artifacts associated with the Late Archaic/Early Woodland occupation consist of a heterogeneous group of 12 stemmed points, in which no more than two are comparable in size and haft morphology. Among these points, there are examples that may be assigned to the Morrow Mountain, Teardrop, Rossville, and Koens Crispin types. Based on raw material, the 12 points in this group form two readily discernible subgroups; 7 are made from argillite, and 5 are made from jasper and chert. Ten of the 12 points in this group are concentrated in an east-west band across the North Excavation Block, encompassing Units 9, 10, 11, 19, 20, 22, and 24 (Figure 30). The two outliers in the group include an argillite example from Unit 38, which may be associated with the argillite workshop area (Feature 33) in the adjacent Unit 46, and a jasper example from Unit 49. The latter point may in fact be a Middle Archaic Morrow Mountain stemmed point, and it was recovered from a context assigned to the Early AU.

Argillite is the lithic raw material most clearly associated with the Late Archaic/Early Woodland occupation. Because argillite accounts for a very small fraction of the lithic assemblage, it is somewhat misleading to identify concentrations of this material. Argillite was used exclusively for the stemmed points assigned to the Late Archaic/Early Woodland group, and it is arguable that all of the argillite in the site assemblage is assignable to the Middle AU, regardless of its specific provenience within the site. Overall, argillite occurs stratigraphically somewhat higher, as measured by raw material frequencies in the excavation levels, than materials such as quartz and quartzite which are most strongly associated with the Early Archaic components (see Figure 9). Most of the argillite was recovered from subsoil contexts in the North Excavation Block (Figure 31), a pattern that is similar to that of the diagnostic stemmed points. The highest frequencies of argillite were from Units 15 and 18, an area which was extensively disturbed by historical burials. Other contexts with high frequencies of argillite occur in Units 41 and 42, located in the South Excavation Block. The high frequency of argillite in Unit 41 includes Feature 33, an early stage biface and a few pieces of debitage, and an associated stemmed point.

Jasper was the second most common raw material used for the Late Archaic/Early Woodland stemmed points, accounting for 4 of the 12 points in this group. One of these points, however, may be a Middle Archaic, Morrow Mountain point, and this example was recovered from a context assigned to the Early AU. A large concentration of jasper in the Middle AU contexts cuts across the North Excavation Block, including portions of Units 10, 14, 15, 18, 21, 22, and 26 (Figure 32). Jasper tools in the Middle AU include 18 projectile points, 1 middle-stage biface, 1 late-stage biface, 6 indeterminate bifaces, 3 endscrapers, 7 retouched flakes, 6 utilized flakes, and 5 bipolar cores. The spatial distribution of jasper tools in the Middle AU contexts shows a somewhat diffuse concentration across most of the North Excavation Block, with the highest frequencies of tools somewhat to the west of the highest debitage concentrations (Figure 33).

Chert, like jasper, is one of the most common lithic materials in the site assemblage, and it is widely distributed across the site. One of the 12 stemmed points assigned to the Late Archaic/Early Woodland

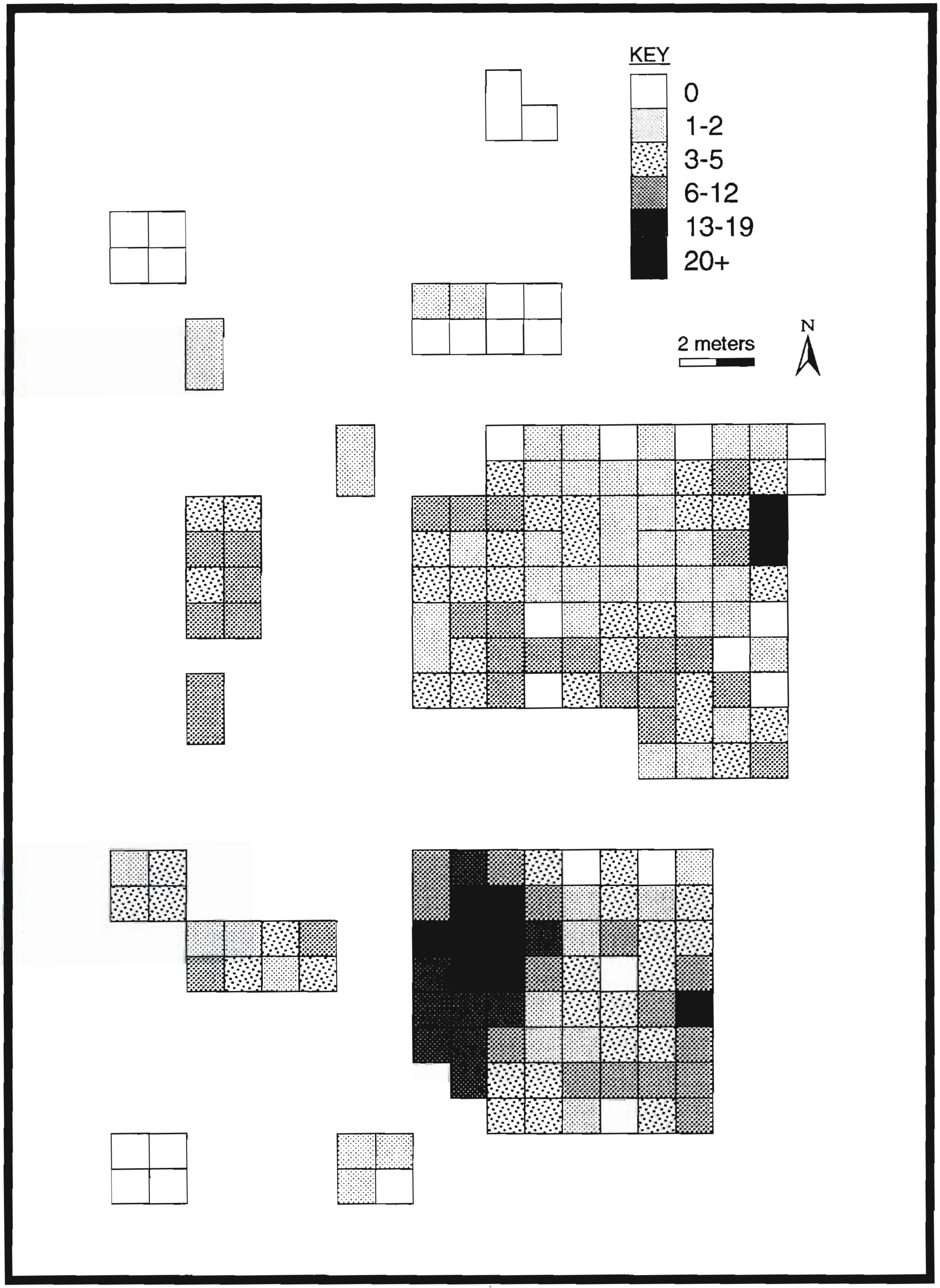


FIGURE 26: Distribution of Jasper in Early AU Contexts

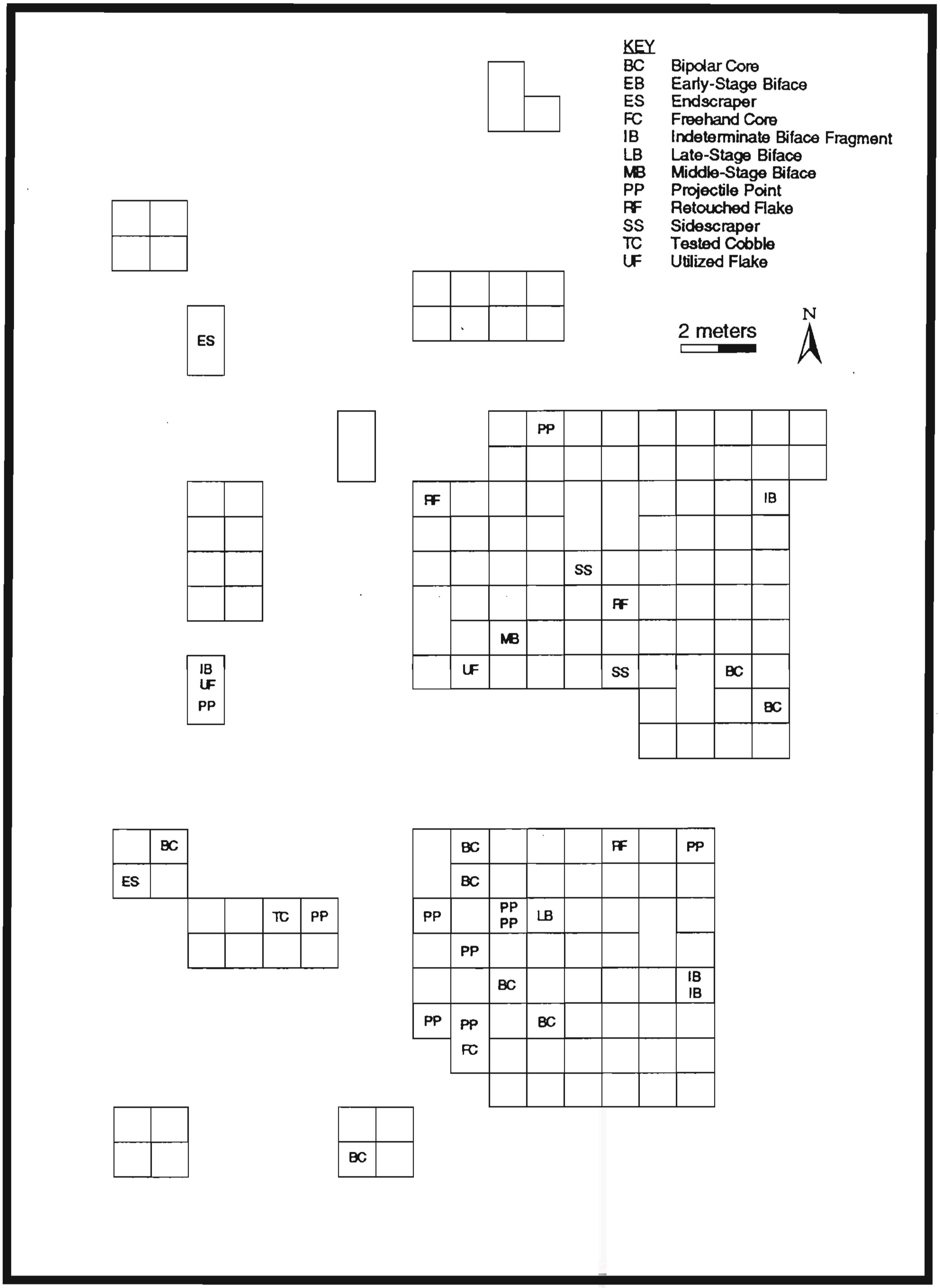


FIGURE 27: Distribution of Jasper Tools in Early AU Contexts

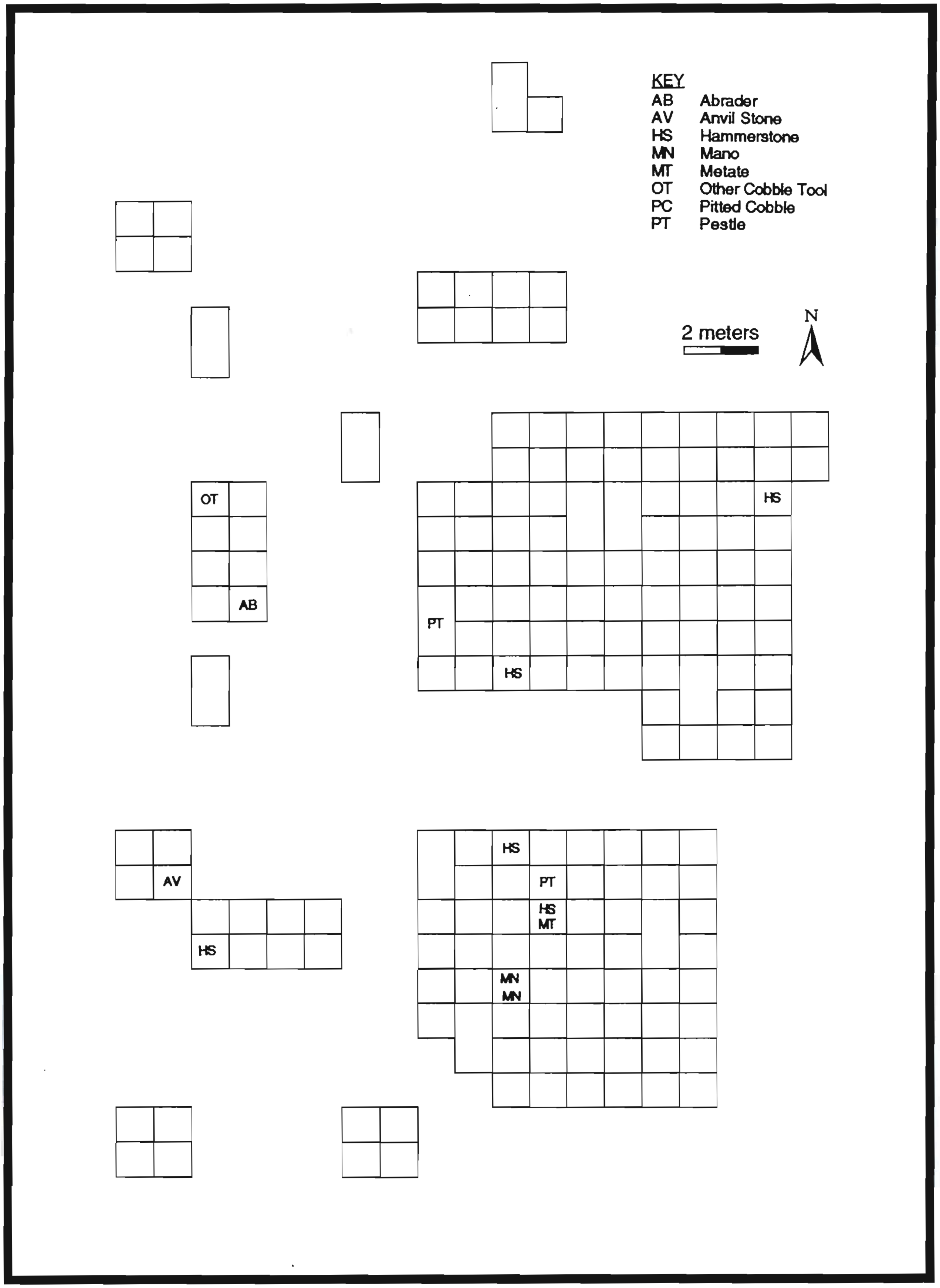


FIGURE 28: Distribution of Cobble Tools in Early AU Contexts

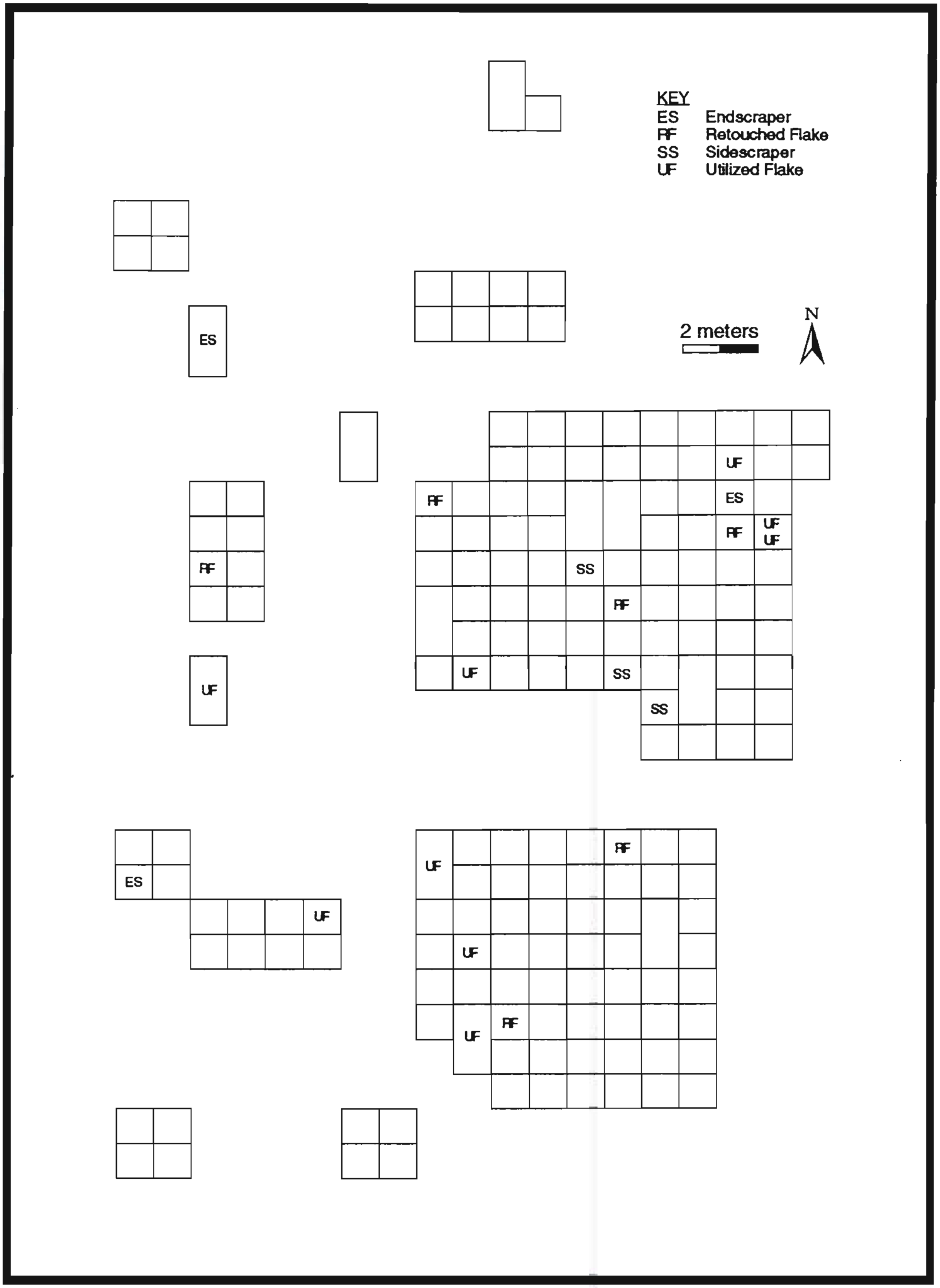


FIGURE 29: Distribution of Unifacial Tools in Early AU Contexts

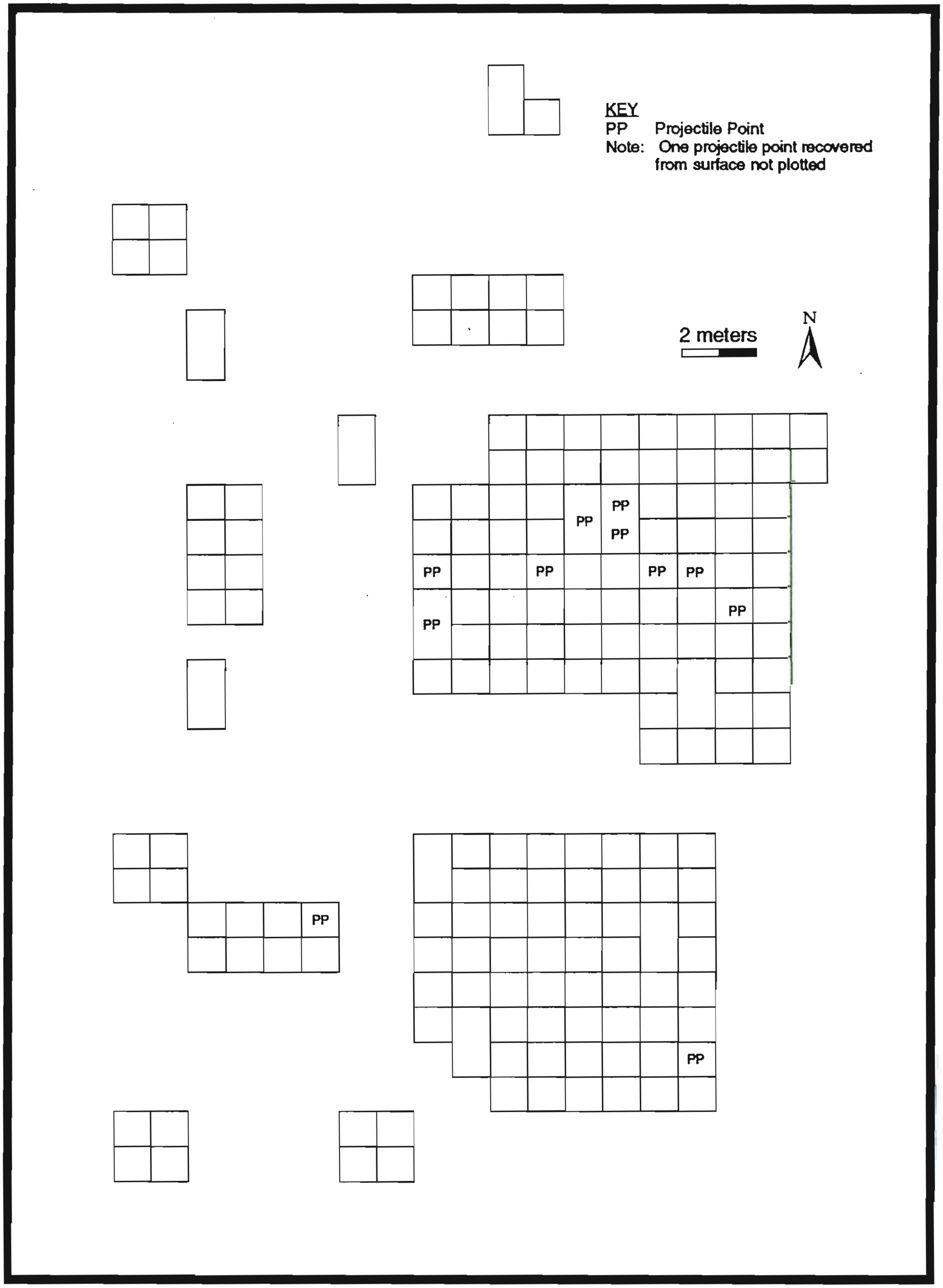


FIGURE 30: Distribution of Late Archaic/Early Woodland Points

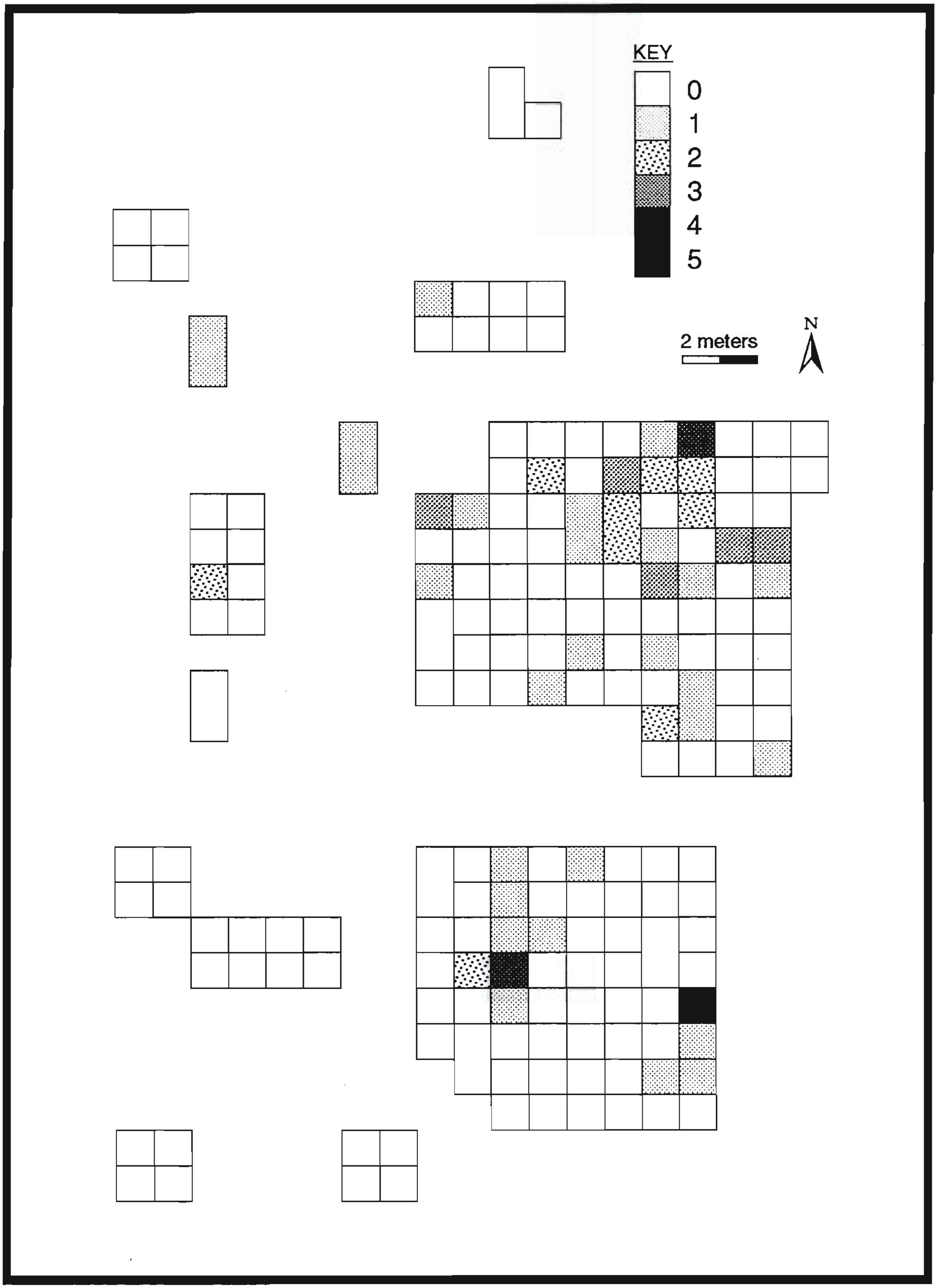


FIGURE 31: Distribution of Argillite in Subsoil (Early and Middle AU) Contexts

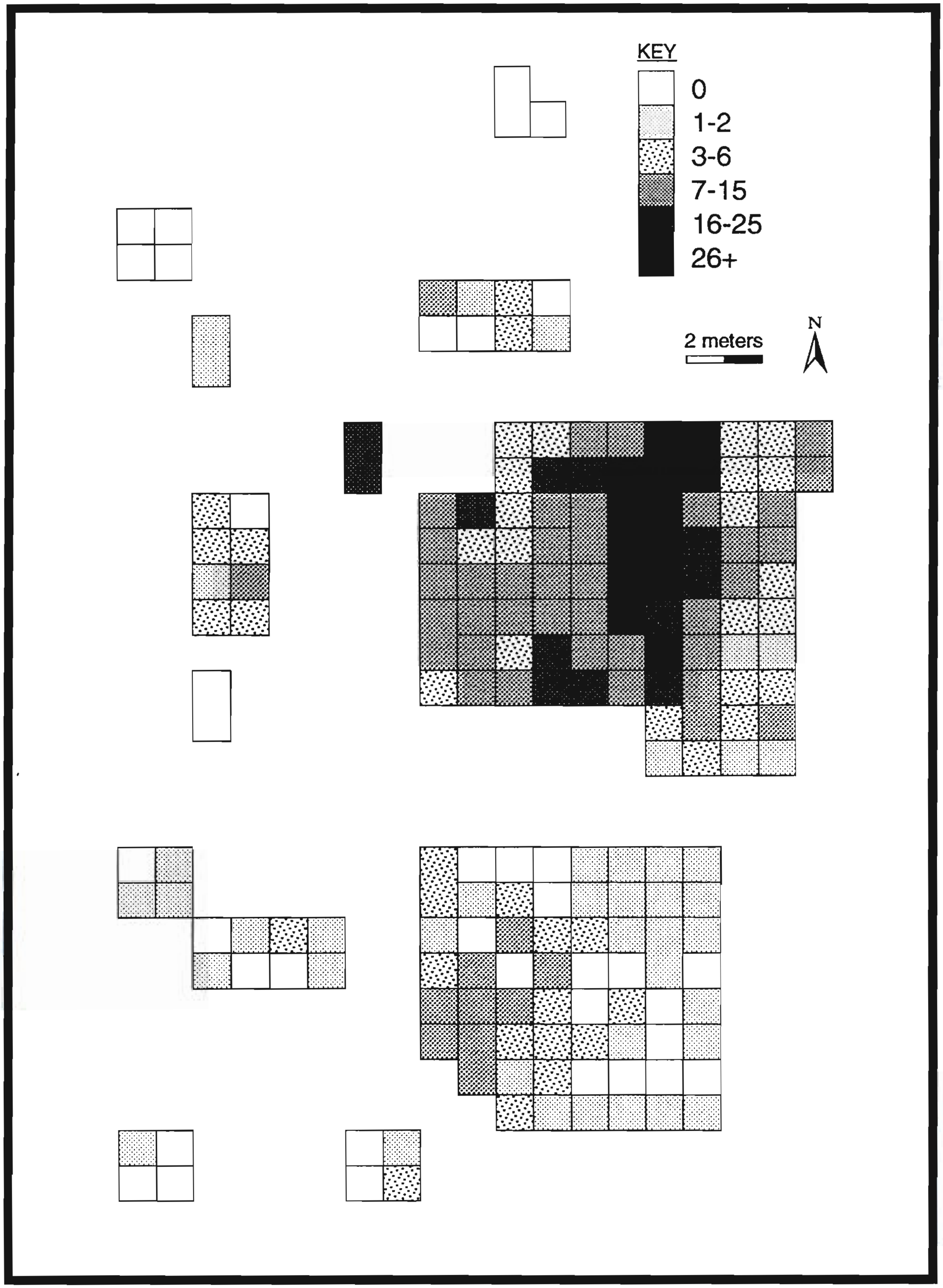


FIGURE 32: Distribution of Jasper in Middle AU Contexts

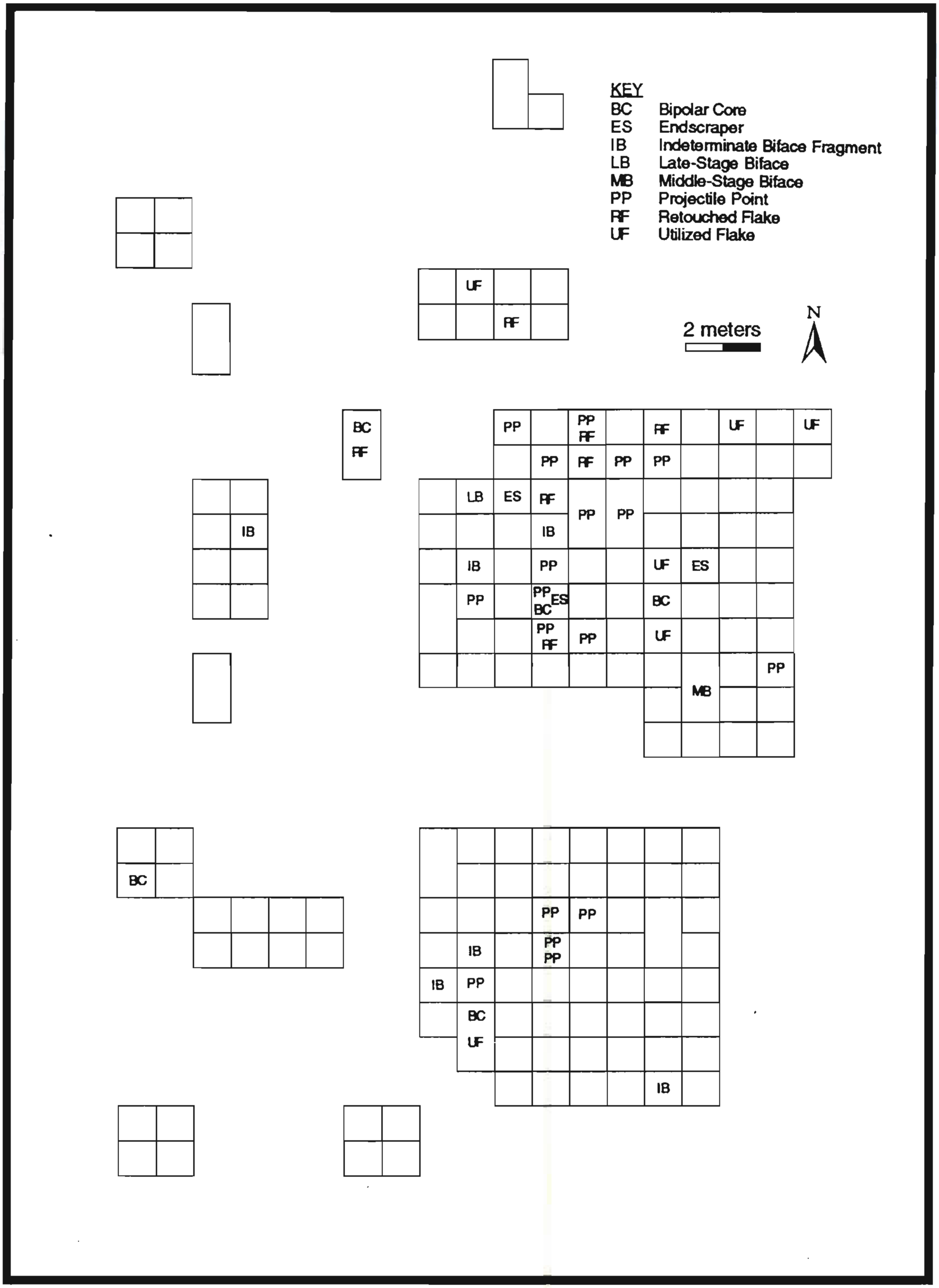


FIGURE 33: Distribution of Jasper Tools in Middle AU Contexts

group was made of chert, although chert was also a preferred material during the Early Archaic. The distribution of chert in Middle AU contexts is comparable to that of jasper, as there is a large concentration in the North Block, extending over several units (Figure 34). Like jasper, the chert concentration overlaps the distribution of Late Archaic/Early Woodland stemmed points, and it encompasses portions of Units 9, 13, 14, 15, 18, 21, and 22. Chert tools in the Middle AU include 8 projectile points, 2 middle-stage bifaces, 3 indeterminate bifaces, 1 endscraper, 1 retouched flake, 3 utilized flakes, and 1 bipolar core. The spatial distribution of chert tools in the Middle AU contexts shows a somewhat diffuse concentration across the site, with most tools in the North Excavation Block, similar to the pattern observed for jasper tools (Figure 35).

Contexts assigned to the Late AU are presumably most representative of the Late Woodland occupation of the site. Diagnostic artifacts associated with the Late Woodland include a single jasper triangular point and the sample of shell-tempered ceramics. The site's ceramic assemblage is quite small, and it is possible that the entire assemblage represents only one or two vessels. The majority of the assemblage is made up of shell-tempered sherds that may be assigned to the Townsend/ Rappahannock ware types of the Late Woodland period, although a few sherds with sand and grit temper may represent Early or Middle Woodland wares. The Late AU coincides with the plowzone contexts, and because these contexts are largely disturbed, analysis of spatial patterning is limited.

The single Late Woodland jasper point was in fact recovered from a context assigned to the Middle AU in the South Excavation Block (Level 2 of Unit 42), which attests to the mixing of deposits. As there is only one diagnostic lithic artifact assignable to the Late Woodland occupation, interpretations of lithic preference must be made with caution. Jasper was a preferred raw material throughout the site's major occupation periods, but the relatively elevated position of this raw material in the site profile (see Figure 9) attests to the preference of this material during the more recent occupations. While jasper was broadly distributed throughout the site's Late AU contexts, three concentrations were identified in Units 15, 21, and 23, all of which are in the North Excavation Block (Figure 36). Two of these units (15 and 23) were extensively disturbed by historical interments. The concentration of jasper in the Late AU contexts is similar to that observed in the Middle AU contexts (see Figure 32). Jasper tools in the Late AU contexts include 8 projectile points, 3 indeterminate bifaces, 1 endscraper, 8 retouched flakes, 2 utilized flakes, 5 bipolar cores, and 1 tested cobble. The broad distribution of these tools across the site (Figure 37) is similar to the distribution of jasper tools in the Middle AU contexts. For ceramics, the vertical distribution is much higher vertical than for any of the lithic materials (see Figure 9). Based on both sherd frequency and total weight, the highest ceramic concentration in the Late AU contexts was in Unit 5, in the North Excavation Block. The general distribution of material associated with the Late AU contexts shows that the deposits are most concentrated in the North Excavation Block. This pattern is similar to that of the Middle AU contexts, which suggests either that the same areas of the site were used during the Late Archaic/Early Woodland and Late Woodland occupations, or that the deposits associated with these occupations have been mixed. Discernment of spatial patterns in the Late AU contexts is hindered by post-depositional disturbances, particularly historic cultivation, roadway construction, and historic interments in the North Excavation Block.

In summary, analysis of the site's internal distribution patterning of various materials has permitted recognition of a number of concentrations that may represent activity areas. The presence of activity areas in association with features is notable in itself, given the loose, sandy soils that are easily displaced by natural turbation processes. While spatial patterning is apparent, it is also evident that there has been a great deal of overlap in the areas of the site used during individual occupational episodes, and there was no clear stratigraphic separation between the deposits associated with different periods or phases of occupation. The internal site patterning is evident from various perspectives. First, there were many examples of individual point types, tools, and debitage concentrations in specific areas of the site, indicating that certain areas were the focal points for various activities within the primary habitation area. Also, the clustering of diagnostic point types indicates that individual occupational phases or episodes occurred within fairly restricted areas of the site.

There is evidence of a Paleoindian occupation of the site, represented by crystal quartz tools and debitage. Crystal quartz was concentrated in Units 35 and 48, located on the western margin of the site. Feature 21, an activity area indicated by a cobble chopper and hoe, was in this area of the site; however, it is likely that Feature 21 is associated with the Early Archaic component, as concentrations of vein quartz, chalcedony, and chert were also present in this area.

Early Archaic occupation of the site is represented by various Palmer, Kirk Corner Notched, Kirk Stemmed, Decatur, and bifurcate-based points, which were made from a variety of raw materials. Concentrations of vein quartz, quartzite, chert, and jasper associated with the Early AU contexts were all located in the South

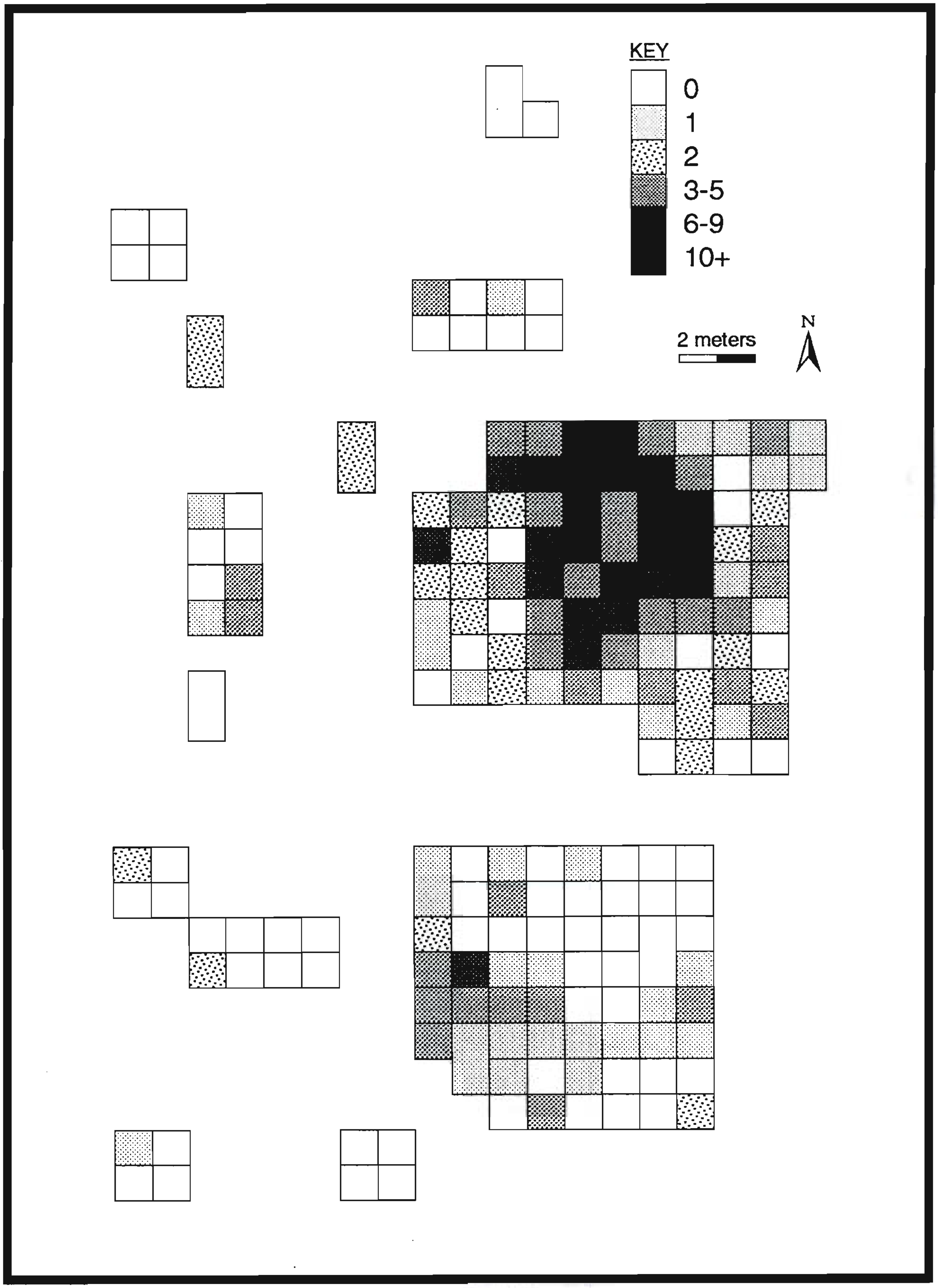


FIGURE 34: Distribution of Chert in Middle AU Contexts

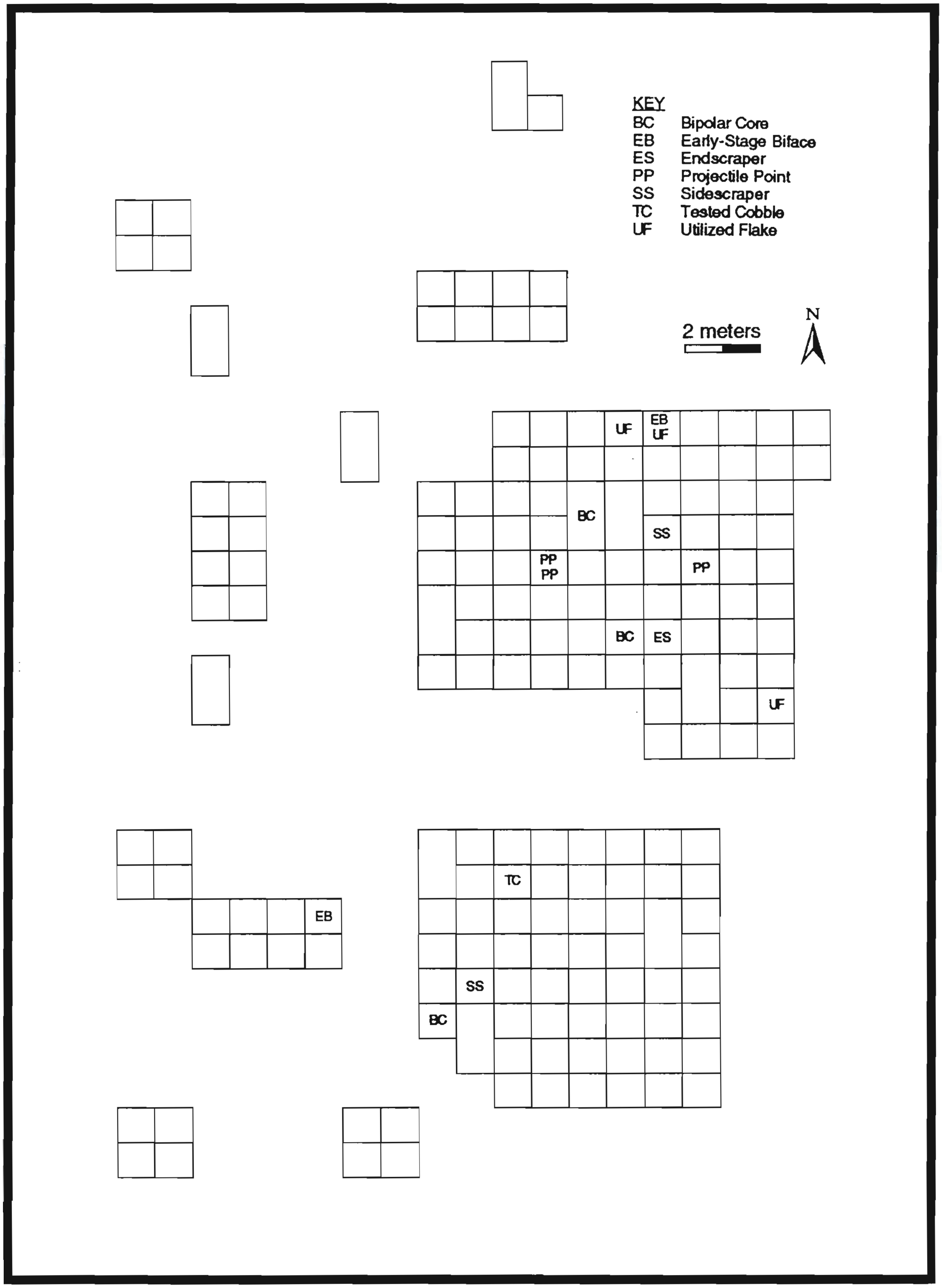


FIGURE 35: Distribution of Chert Tools in Middle AU Contexts

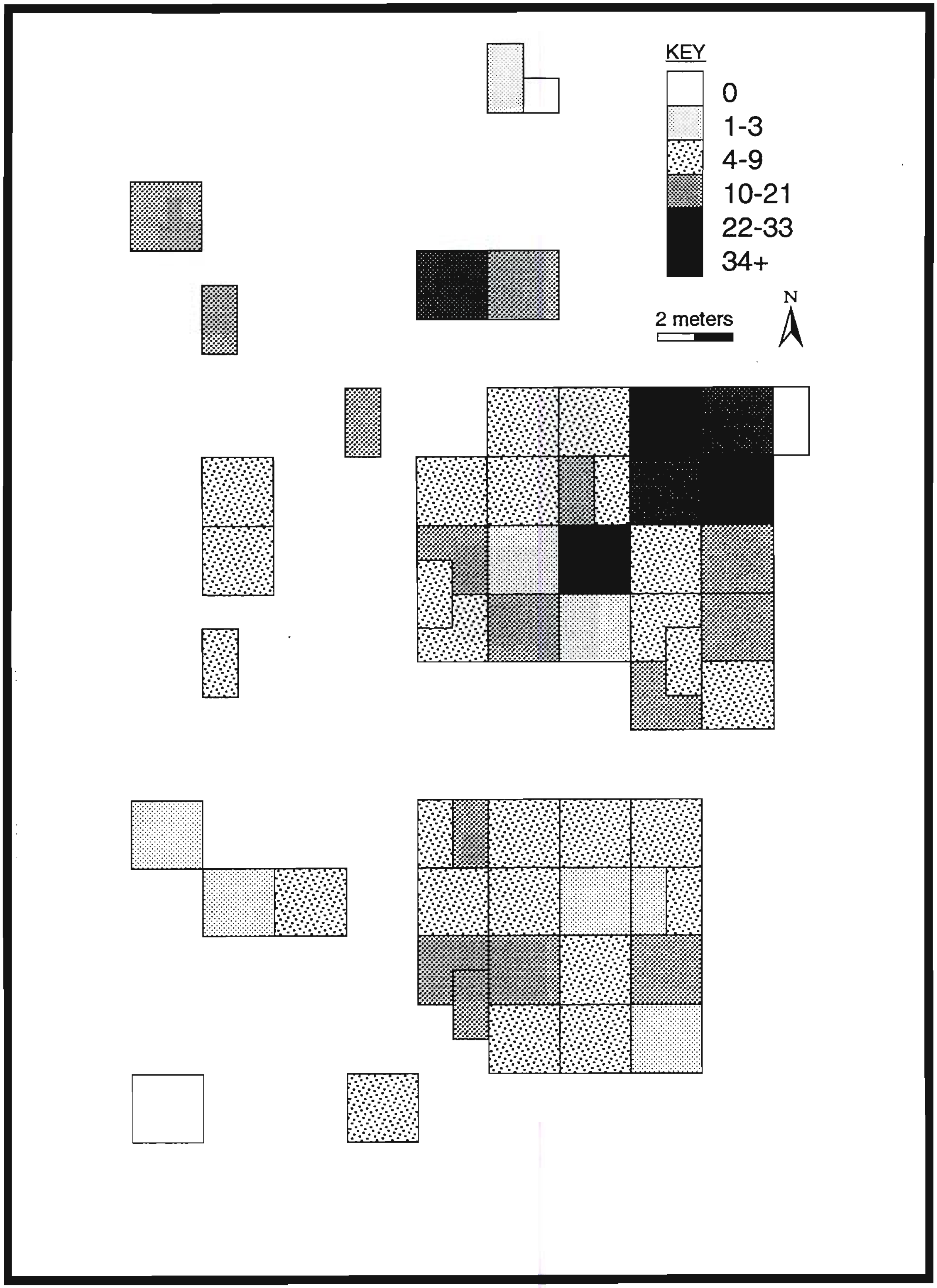


FIGURE 36: Distribution of Jasper in Late AU Contexts

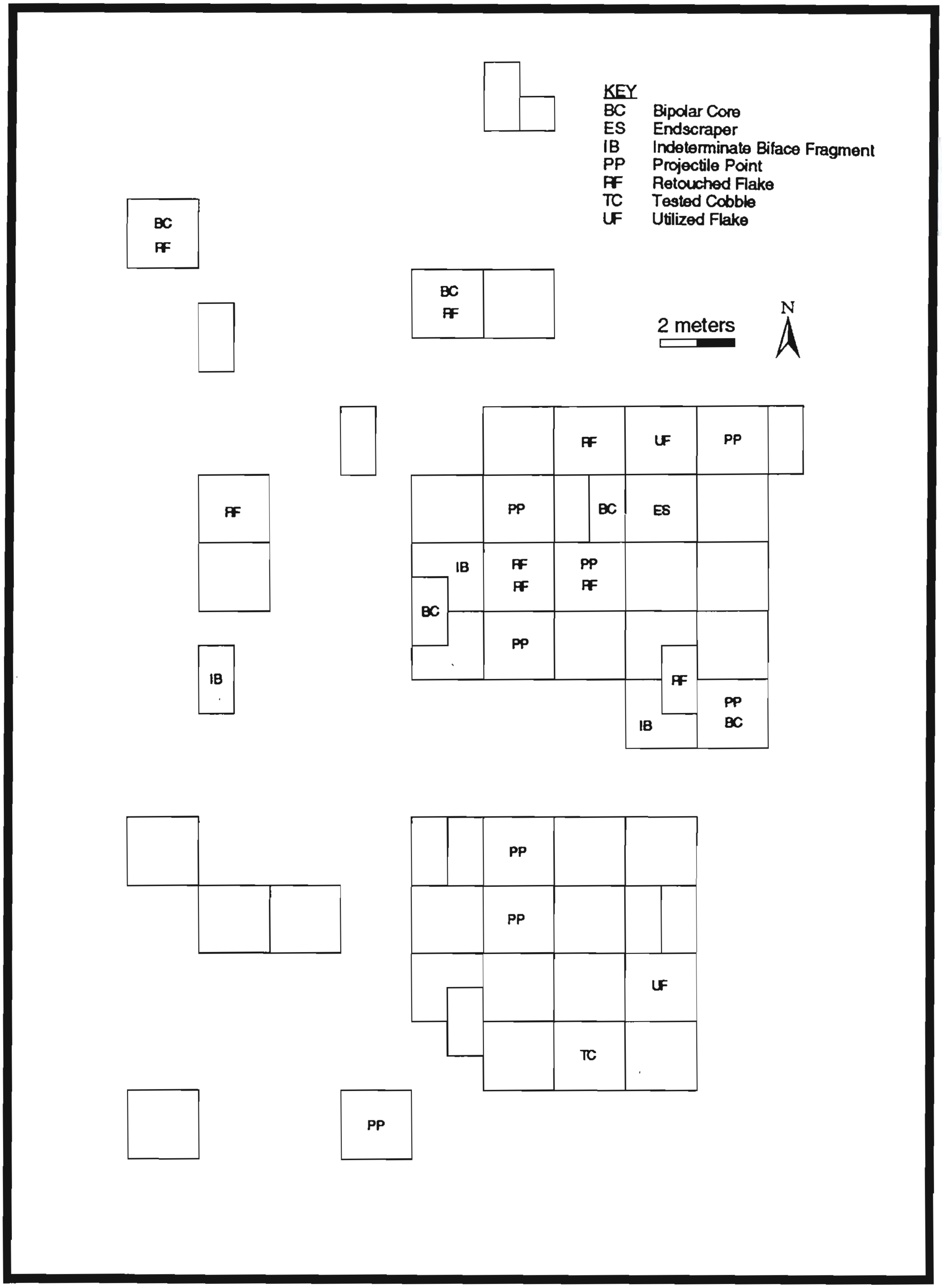


FIGURE 37: Distribution of Jasper Tools in Late AU Contexts

Excavation Block, apparently associated with a formal cooking/heating area represented by a concentration of FCR (Feature 31) and a milling area consisting of a mano and metate (Feature 22). The largest concentration of Early Archaic points was located in this area, and within the same unit (Unit 45) that yielded the oldest radiocarbon sample from the site. This date (7560 $\pm$ 340 years BP; sample # Beta-56049) is consistent with an Early Archaic use of this part of the site. The overlapping of vein quartz, quartzite, chert, and jasper in this area of the site suggests a relatively consistent use of this part of the site during the repeated episodes of site occupation during the Early Archaic. While the spatial distribution shows a consistent pattern of projectile points, debitage, and cobble tools in the South Block, it is also interesting that the unifacial tools associated with the Early AU contexts are more widely distributed over the site area. It was noted that a vein quartz sidescraper, and various chert and jasper unifacial tools were consistently recovered from Early AU contexts in the North Excavation Block, suggesting that this was a secondary activity area used for tasks such as hide processing during the Early Archaic.

The distribution of Late Archaic/Early Woodland points also exhibited a distinct spatial pattern, with most points located in the North Excavation Block. Although a majority of the points assigned to that group were made of argillite, the overall scarcity of argillite in the assemblage precluded identification of an associated lithic reduction area. Other raw materials associated with the Late Archaic/Early Woodland occupation, notably jasper and chert, did exhibit concentrations in the North Excavation Block, overlapping the distribution of diagnostic stemmed points. Identification of spatial patterning associated with the Late Woodland component was limited by the fact that the contexts associated with that component had been subjected to various post-depositional disturbances such as historic cultivation and historic interments.

F. RESIDUE ANALYSIS

While charred plant remains were recovered from prehistoric contexts, faunal remains were nonexistent, owing greatly to local soil conditions. Consequently, residue analysis was undertaken in the hope that subsistence information could be gleaned from the surfaces of stone tools. Two levels of residue analysis were conducted, in addition to a limited test for pollen. The pollen test involved the examination of two cobble tools found in close association (Feature 22) that may represent a plant processing unit (mano and metate). The pollen analysis, however, proved to be inconclusive (Kelso 1992). Residue analysis tested for traces of blood and proteins. The Level I analysis is a simple presence-absence test for blood, and the Level II analysis is a sophisticated family-level, or in some cases a species-specific, test that detects not only traces of blood proteins but also of proteins from body tissues and fluids. Both methods focus on residues from animals, but the Level II analysis also tests for fern residue.

Before proceeding to a summary of the results of the analyses, it should be noted that residue analysis is a relatively new analytical tool employed by archaeologists, and its analytical value is not yet fully understood. While interesting and encouraging test results have been achieved, particularly with family- and species-level tests, attempts at independent verification of test results have been limited. In addition, a number of questions, particularly about the effects of various site formation processes, have yet to be resolved to the satisfaction of many researchers.

As part of both the Level I and the Level II analyses, sediments from the site were submitted for testing. These "control samples" all tested negative. Specimens were selected for residue analysis in the laboratory and were not washed or labeled, but they were inventoried and photocopied with a minimum of handling. Currently, none of the artifacts that were submitted for analysis have been washed, although dry brushing has been done. Specimens that tested negative in the Level I analysis and were not subjected to Level II analysis were labeled. Artifacts that tested positive at either level have not been labeled.

1. *Level I: Presence/Absence Testing*

Level I testing was performed by the Archaeology Laboratory at the University of Delaware, under the direction of Dr. Jay Custer. The method used is simple; in brief, it entails creating a solution with distilled water and soil adhering to the surface of an artifact. This solution is tested for blood residue by using a commercially available chemstrip, which registers the presence of blood residue by changing colors (see Custer et al. 1988a, 1988b).

In total, 186 lithic artifacts, representing six different artifact classes, were tested (Table 21). Only seven specimens tested positive: one biface and six pieces of debitage. These seven, along with 43 other specimens, were submitted for family-level testing. Eleven of the 43 had been tested and produced a negative result for the presence of blood residue but were included in the Level II sample as a means of cross-checking the efficacy of the two techniques (see also LeeDecker et al. 1991:107).

TABLE 21: SUMMARY OF LEVEL I BLOOD RESIDUE ANALSIS RESULTS

ARTIFACT CLASS	TOTAL ARTIFACTS	PRESENT	ABSENT
Bifaces	41	1	40
Unifaces	25	0	25
Cores	19	0	19
Debitage	77	6	71
Cobble Tools	10	0	10
Cracked Rock	14	0	14
TOTAL	186	7	179

2. *Level II: Family-Level Testing*

Family-level animal and plant (fern) residue tests were performed under the direction of Dr. Margaret Newman at the Laboratory for Archaeological Science, California State University, Bakersfield (Newman 1993).

Fifty artifacts were tested: 33 bifaces, 7 unifaces, 2 cores, 2 cobble tools, and 6 pieces of debitage. Eleven produced positive results (9 bifaces, 1 uniface, and 1 debitage), and 5 produced a nonspecific reaction (NSR) (Table 22). Of the 17 "families" for which the 11 artifacts were tested, 7 were found to be present: one biface tested positive for deer and rabbit; three bifaces tested positive for deer; one biface tested positive for rabbit; two bifaces tested positive for dog; one biface tested positive for Guinea pig; one biface tested positive for bovine; one uniface tested positive for bear; and one early-reduction flake tested positive for chicken.

It must be stressed that these "families" are based on immunological associations and do not necessarily have a direct relationship to the Linnaean classification scheme. The family names refer to the antisera that are prepared for use in the analysis (Newman 1993). However, it can be inferred that a positive reaction to the deer antiserum marks the presence of white-tailed deer, and likewise, that rabbit antiserum is indicative of cottontail rabbit or related species; dog antiserum can indicate any member of the Canidae family (e.g., wolf, fox, or domestic dog); guinea-pig antiserum could include beaver, squirrel, or porcupine; bovine antiserum indicates American bison or domestic species; bear antiserum implies the presence of black bear; and chicken antiserum could indicate any number of upland game birds (e.g., wild turkey, quail, or grouse).

3. *Discussion*

Before discussing the subsistence implications of the test results, it must be mentioned that an important methodological issue is brought to light when one compares the results of the Level I and Level II analyses. The fact is, the correlation between the results is very low: of the seven artifacts that tested positive for the presence of blood residue during the Level I testing, only one of them tested positive during the Level II testing. In other words, one biface and six pieces of debitage tested positive for the presence of blood, but during the family-level testing only one piece of debitage tested positive. Dr. Newman suggests two likely explanations: either the Level I testing removed all traces of blood, or the Level I positive results were caused by contaminants (see also Manning 1994).

Equally interesting is the biface (Cat. #926) that tested negative for blood residue during Level I testing, but during Level II testing, produced a positive reaction to deer (Plate 19:h). This result could be explained by a number of factors. First, the areas of the biface that were tested during the Level I analysis were not the same as those tested during the Level II analysis. Second, the same areas were tested, but the Level I analysis removed sediments from the biface that did not contain blood residue. For example, the Level I testing solution could have been made from sediments that were adhering to the biface but that did not actually come from its surface--that is, the interface between the stone and the adhering sediments. Third, all conditions of testing were the same, but the Level I test results were misread or a defective chemstrip was used.

Whatever the case, it is clear that presence-absence testing with chemstrips is *not* an effective method for predicting which artifacts will produce positive results at the family level. From a budgetary standpoint, it is true that more artifacts can be tested for the same amount of money with the presence-absence approach, but the results are less specific than the family approach. Because the amount of residue adhering to any one artifact is limited, the most prudent use of that residue would be to limit its use to family-level or species-level testing.

In discussing subsistence, only the family-level test results are considered. Deer was detected on four bifaces, rabbit on two bifaces, dog on two bifaces, guinea pig on one biface, bovine on one biface, bear on one endscraper, and chicken on one early-reduction flake (Table 22). That bifaces tested positive more often than other tool types is a predictable result because they account for 66 percent of the sample. Overall, the results indicate that deer were an important resource to the inhabitants of Site 7S-F-68, and

TABLE 22: LEVELS I AND II BLOOD RESIDUE ANALYSIS RESULTS

ARTIFACT CLASS	CATALOG NO.	LEVEL I RESULTS	LEVEL II RESULTS
Biface	49	-	Deer
	50	-	Negative
	60	-	Negative
	67	-	Deer and Rabbit
	68	-	Deer
	73	-	Negative
	102	-	Negative
	133	-	Dog
	160	-	Negative
	193	-	NSR
	200	-	Guinea Pig
	242	-	Negative
	262	-	Negative
	380	-	Negative
	425	-	Bovine
	455	Absent	Negative
	484A	-	Dog
	484B	-	Negative
	502	Absent	Negative
	541	Absent	Negative
	544	Absent	NSR
	579	-	Negative
	706	Absent	Negative
	725	-	Rabbit
	874	-	NSR
	875	-	NSR
	884	-	Negative
	893	-	Negative
	910	-	NSR
	926	Absent	Deer
	960	-	Negative
	1037	Absent	Negative
	1353	Present	Negative
Uniface	59	Absent	Negative
	125	-	Negative
	262	-	Bear
	329	Absent	Negative
	354	-	Negative
	610	-	Negative
	967	Absent	Negative
Core	775	-	Negative
	1025	Absent	Negative
Debitage	574	Present	Negative
	897	Present	Negative
	902	Present	Negative
	1002	Present	Negative
	1021	Present	Negative
	1231	Present	Chicken
Cobble Tool	508A	Absent	Negative
	508B	Absent	Negative

NSR: nonspecific reaction.

also that a broad range of fauna were taken for food and/or materials: large-game animals (deer, bear, and bison or possibly elk), small-game animals (rabbit, beaver or squirrel, and wolf or fox), and upland game birds (wild turkey or grouse or quail). A preference for upland game is evident, especially considering that although the family-level analysis included antisera for duck and trout, none of the artifacts tested positive for either of these taxa. Perhaps this preference is linked to the site's location and function; Site 7S-F-68 could have served as a campsite for groups hunting upland game and/or gathering plant resources.

This is, however, a composite view of subsistence. A number of different components are represented by the artifacts that tested positive: Early Archaic points (*N*=3) tested positive for deer, dog, and guinea pig (Plate 10); a Middle Archaic point tested positive for deer and rabbit (Plate 11); Late Archaic points (*N*=2) tested positive for rabbit and bovine (Plate 12); and a Late Woodland point tested positive for dog (Plate 14). A larger sample of temporally diagnostic artifacts with positive results would help to clarify subsistence patterns. Even so, the composite view may reflect a basic, unchanging pattern of use. The site might have been an important campsite and staging area for exploiting upland fauna and flora throughout much of prehistory.

G. SUMMARY AND CONCLUSIONS

The five research topics outlined at the beginning of the chapter have been examined to varying degrees in the preceding pages. Below, each topic is briefly summarized.

The investigation of site chronology resulted in the identification of five components: Paleoindian, Early Archaic, Middle Archaic, Late Archaic/Early Woodland, and Late Woodland. A minor Middle Woodland component may also be present. The occupants of each of these components appear to have used the site as a temporary campsite, probably while they were in the area hunting and/or collecting plant foods. The Early Archaic and Late Archaic/Early Woodland components were the most intensive occupations, and the former appears to have been slightly more intense than the latter.

Analysis of the site's internal patterning has permitted recognition of a number of possible activity areas, represented by concentrations of raw materials and tools. Although there was only limited evidence of Paleoindian occupation of the site, the assemblage of crystal quartz tools and debitage associated with this component was concentrated in a small area on the western margin of the site.

Deposits associated with the Early Archaic occupation(s) of the site were concentrated in the South Excavation Block and were apparently associated with a formal cooking/heating area represented by a concentration of FCR (Feature 31) and a milling area consisting of a mano and metate (Feature 22). While the Early AU spatial distributions showed a consistent pattern of projectile points, debitage, and cobble tools in the South Block, it is also interesting that the unifacial tools associated with these contexts were more widely distributed over the site area, possibly representing secondary activity areas used for tasks such as hide processing. Feature 21, an activity area consisting of a cobble chopper and hoe, probably belongs to the site's Early Archaic component.

The distribution of Late Archaic/Early Woodland points also exhibited a distinct spatial pattern, with most points located in the North Excavation Block, suggesting a shift in the primary occupation area within the site. Identification of spatial patterning associated with the Late Woodland component was limited by the fact that the Late AU contexts had been subjected to various post-depositional disturbances.

Although the site appears to have served the same basic function for each component, different raw material procurement strategies indicate that some groups ranged farther than others for raw material; thus, it can be suggested that their settlement patterns were more wide ranging. The Middle Archaic (Otter Creek) component appears to have been the most wide ranging. In contrast, the Late Archaic/Early Woodland component may have been the least mobile because, as it has been argued, these groups procured lithic raw materials through exchange networks. Little can be inferred about subsistence beyond the observation that all or most the components appear to have been interested in local plant foods and upland game.

It must be stressed in conclusion that the preceding interpretations are biased--they represent primarily the "lithic view" of the site. Stone tools were an important part of the overall technology and economy of the Archaic and Woodland groups that briefly inhabited the site; yet these implements furnish only certain kinds of information. With new techniques, such as residue analysis, stone tools and debris may provide archaeologists with additional avenues with which to study the economies of extinct cultures.